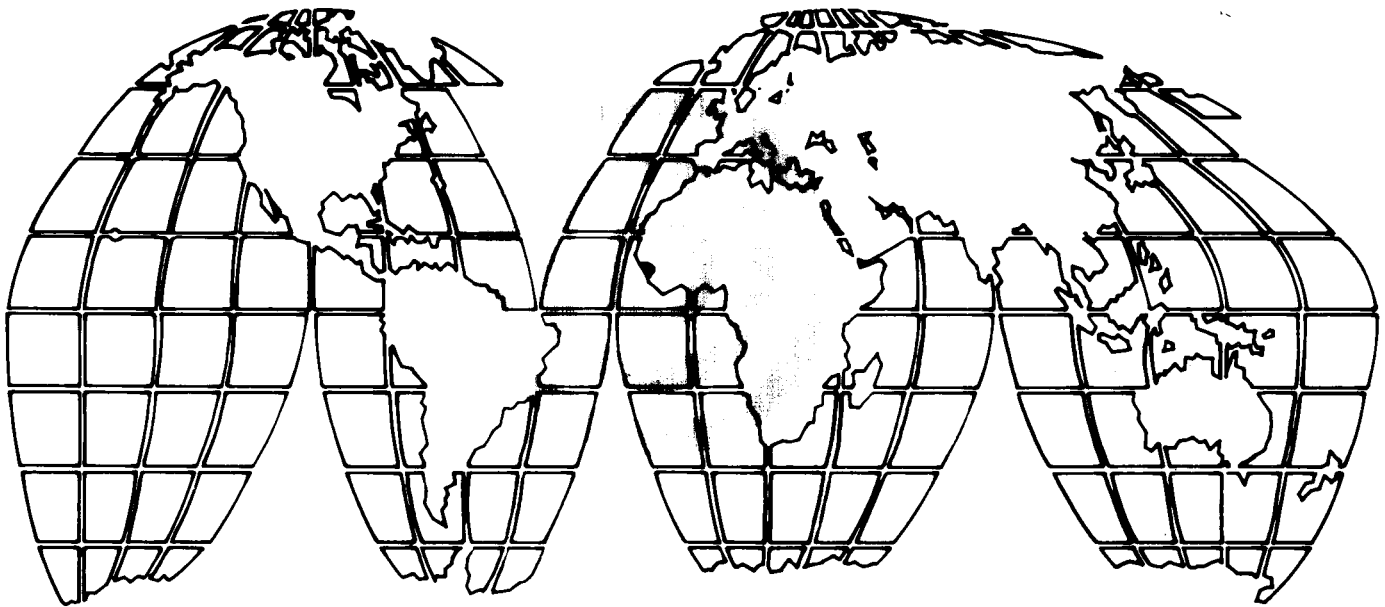


A.I.D. Project Impact Evaluation Report No. 7

Effectiveness and Impact of the CARE/Sierra Leone Rural Penetration Roads Projects

BEST AVAILABLE



June 1980

Agency for International Development

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EFFECTIVENESS AND IMPACT OF THE CARE/SIERRA LEONE
RURAL PENETRATION ROADS PROJECTS
(AID Projects 636-0101, 636-0111, 636-0126)

PROJECT IMPACT EVALUATION NO. 7

by

G. William Anderson, Economist
(Bureau for Program and Policy Coordination)

Agency for International Development

June, 1980

The views and interpretations expressed in this report are those of the author and should not be attributed to the Agency for International Development.

PREFACE

As a preliminary part of its work in evaluating the impacts of AID rural road projects, AID's Office of Evaluation in the Bureau of Program and Policy Coordination (PPC/E) participated in the third annual evaluation of the CARE/Sierra Leone Rural Penetration Roads Project. I was assigned to the evaluation team and, in addition, was expected to prepare a separate report on the socio-economic impact and maintenance of the CARE feeder roads. Because socio-economic surveys had been carried out in 1977 and 1978 in the areas where the roads were being constructed and additional surveying was going on at the time of the evaluation team's visit, it was hoped that this material, combined with my field visit, could provide sufficient data for an impact evaluation of the project. Further, I was expected to distill from my experience a number of lessons about how to carry out rapid impact evaluations.

The evaluation team arrived in Sierra Leone in the evening of July 19, 1979, and left on Sunday, July 22 -- a total of 4 days (counting weekends and not counting the arrival and departure). In Freetown, the capital of Sierra Leone, the team met with CARE staff and officials of the Ministry of Development and Economic Planning, the Ministry of Works, and the Ministry of Agriculture concerning the project. The team spent three days "up-country" in the Makeni, Bo, and Kenema areas inspecting the roads that CARE had built, visiting CARE equipment maintenance workshops, conferring with Mr. Anthony Airey (the social scientist carrying out the socio-economic surveys on the roads' impacts), and interviewing officials of the World Bank-funded Integrated Agricultural Development Projects (which the CARE roads were intended to support). I spent two additional days in the Makeni area with the aim of observing Mr. Airey's socio-economic survey work. However, a vehicle breakdown and other difficulties prevented me from accompanying Mr. Airey to local villages in the Makeni area although I was able to discuss further with him his survey methods and results and to interview others in the Makeni area involved in development activities.

PPC/E participation in this annual evaluation was an experiment to learn more about doing impact evaluations and to establish how much time and effort is necessary to answer certain questions. As the reader will discover, not all questions concerning the impact of the CARE rural or feeder roads have been adequately investigated or answered. Many questions concerning how to evaluate the impact of projects have been answered. For example, it was learned that adding one person to an annual evaluation team is not a feasible way to study project impact, even if a significant amount of socio-economic information has been collected.

The 1979 annual evaluation of the CARE/Sierra Leone Rural Penetration Roads II project was released on October 15, 1979. Members of the team included:

James Hradsky, Project Officer/Economist (REDS /WA)
 Richard Hudley, Chief Engineer (REDSO/WA)
 Dennis Brown, Project Coordinator (CARE/Freetown)
 Anthony Airey, Survey Research (Contract)
 G. William Anderson, Program Evaluation Officer (AID/W,
 PPC/E)

Although the aims of this report and those of the annual evaluation were somewhat different, they overlap in certain areas. I provided some material for the annual evaluation report and utilized some material from that evaluation for this report. This report benefited greatly from my participation in the annual evaluation of the project and from collaboration with other members of the annual evaluation team.

I wish to thank a number of individuals for their help in learning (1) about the effectiveness and impact of the CARE/Sierra Leone Rural Penetration Roads Project and (2) about how to evaluate better the impact of such projects:

- Mr. James Hradsky and Richard Dudley of AID's REDSO/WA office for their patience and collaboration and Mr. Anthony Airey for sharing his knowledge of rural Sierra Leone;
- Mr. Robert Huddleston (AAO/Freetown), Ms. Betty Cole, and other members of the AID staff in Freetown for their willing assistance in finding information, handling travel and lodging arrangements, providing transportation up-country, and for helping in innumerable other ways;
- Embassy Economic Officer Ms. Vicki Huddleston, for her invaluable help in explaining the workings of the Sierra Leonean economy;
- Officials of the Government of Sierra Leone's Ministry of Works (MOW), Ministry of Development and Economic Planning (MODEP), and Ministry of Agriculture for their time and assistance in studying this project;
- Staff of the Eastern and Northern IADP's for their time in explaining the workings of their projects and the role of the CARE roads; and
- The staff of CARE/Sierra Leone for their time and effort in providing information regarding the project, discussing progress and problems, and assisting both the evaluation team and me in innumerable other ways.

Ms. Sallie T. Alvin and Mrs. Rita A. Jan persevered through several drafts to produce a final report, and I would like to gratefully acknowledge their efforts and support.

Finally, I assume full responsibility for the statements and conclusions of this report.

EXECUTIVE SUMMARY

Introduction: The first of the CARE/Sierra Leone Rural Penetration Roads Projects began in fiscal year (FY) 1975 and Phase II will be completed in FY 1980. The total funding for the projects has been \$11.7 million of which AID has provided \$5.1 million, the largest single share. Additional contributions have come from CARE, the Government of Sierra Leone (GOSL), the Peace Corps, the United Kingdom's volunteer organization (V.S.O.), and the World Bank. AID designed the projects to support Integrated Agricultural Development Projects (IADP's) funded by the World Bank. The IADP's were to provide farmers with improved crop varieties, fertilizer, extension advice, and better marketing services, and the Rural Penetration Roads Projects were to improve farmers' access to IADP services. Many, if not all, of the impacts of the roads are intertwined with the socio-economic and environmental impacts of the IADP's themselves. A private voluntary organization, CARE (Cooperative for American Relief Everywhere) has implemented the projects.

Effectiveness: By the end of FY 1980, CARE will have constructed 417 miles of feeder roads compared to a projected 1300 miles (900 miles in Phase I and 400 miles in Phase II). Costs per mile were much higher than anticipated: \$15,125 in Phase I compared to a projected cost of \$4,000 and \$29,400 in Phase II compared to a projected cost of \$12,000. These construction shortfalls and cost per mile overruns were caused by substantial AID funding delays, faulty construction planning by AID and CARE, higher than anticipated equipment breakdowns, and lack of suitable personnel.

In spite of these problems, which are common to road projects in developing countries, the construction effort has been moderately successful. Although mileage and cost estimates were overoptimistic, upon completion the project will have increased by more than 50 percent Sierra Leone's feeder road mileage in good condition. In addition, CARE has been successful in involving local chiefs and villagers in both construction and maintenance and in instituting a relatively more objective road selection process. Whether the GOSL can adequately maintain the 417 miles of roads built remains questionable, for the projects have failed to develop a feeder road maintenance capability within the GOSL.

Impact: The overall socio-economic impact of the CARE roads at present has been positive. At the same time, questions exist concerning negative impacts, which over time could overwhelm the positive effects. On the positive side, socio-economic surveys indicate that the CARE roads are associated with more frequent agricultural extension agent visits, increased traffic and transport services, higher quality cement construction in villages, higher purchases of consumer goods, and more health services in villages served by CARE roads. The CARE roads may have played

some role in facilitating increased fertilizer use; in bringing about wider cultivation and marketing of cash crops; in expanding commercial activity; and in increasing educational opportunities.

On the negative side, the CARE roads are associated with a shorter range of fallow period for upland rice cultivation, greater rice scarcity, and increased swamp rice cultivation. All these conditions suggest substitution of cash crops for food crops, particularly rice. Some indications exist that the CARE roads, because of the above effects, are associated with declining soil fertility, deforestation, increased soil erosion, and increased exposure of swamp rice farmers to waterborne diseases. The relationship of the CARE roads to migration is unclear. Since some CARE roads function as arterial or trunk roads connecting major provincial towns, these roads probably encourage migration. Those roads that function as true feeder roads, connecting villages to rural market towns, likely retard rural-urban migration.

Tentative Lessons Learned for Rural Roads Projects:

- Before funding rural road projects, AID should determine whether complementary activities with which the roads are associated are likely to have net positive or negative impacts.
- To document the immediate socio-economic impacts of rural road projects, AID should carry out periodic limited baseline and impact surveys during project implementation, as in the Sierra Leone case.
- To ensure that the impacts of AID-funded rural road projects will continue to be examined, AID should improve budgetary and career incentives for impact evaluation.
- In designing and implementing rural road projects, AID should emphasize development of the host country's capacity to maintain the roads constructed and to carry out its own rural road construction.
- To help ensure that maintenance is performed, AID should condition funding of annual tranches of rural road projects on satisfactory maintenance of the roads constructed.
- In future grants to private voluntary organizations (PVO's) for rural road construction, AID should require explicit commitments by host governments to fund maintenance.

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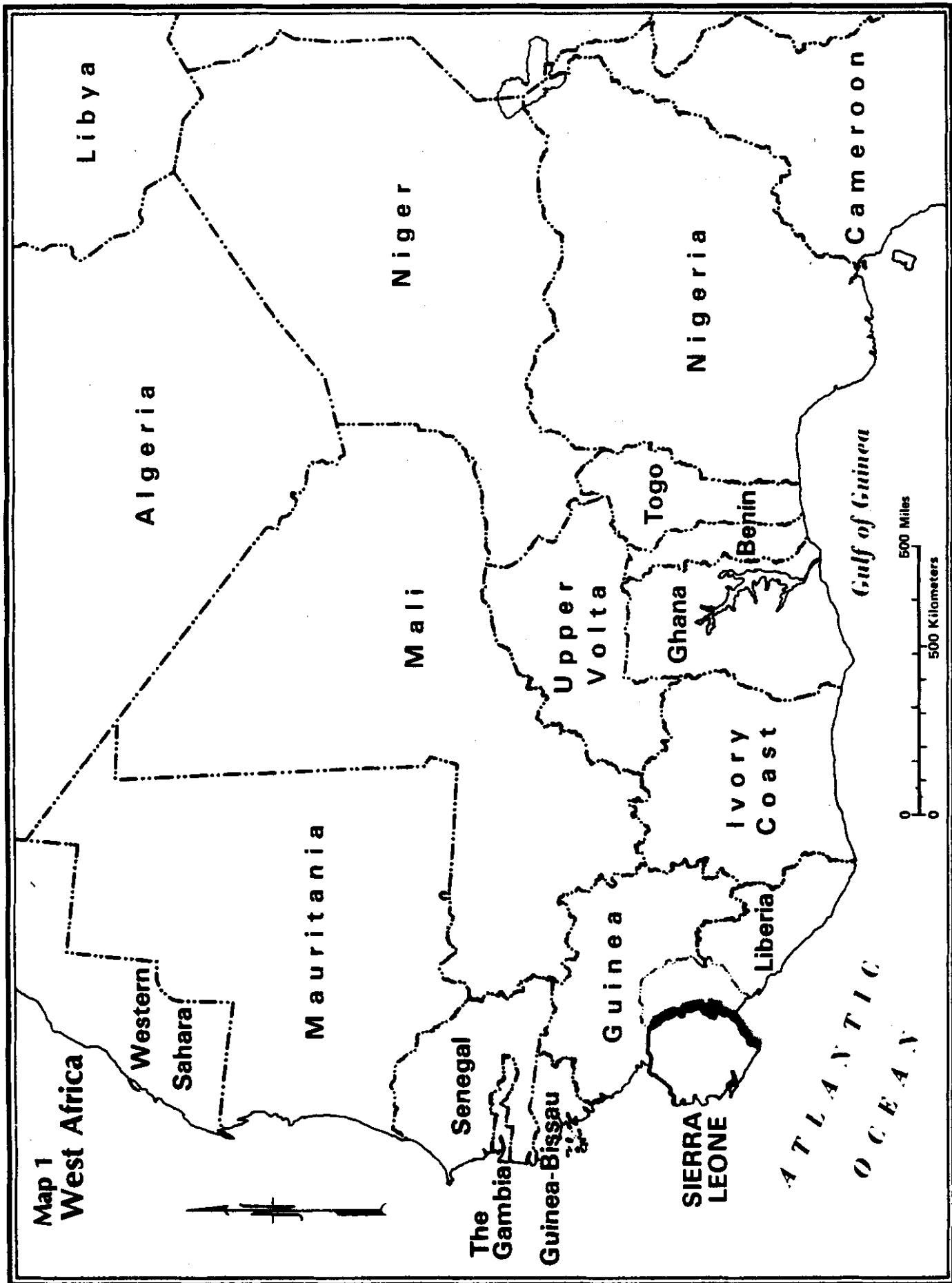
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GLOSSARY--ACRONYMS AND TERMS

AID.	Agency for International Development (U.S.A.)
CARE	Cooperative for American Relief Everywhere
CUSO	Canadian University Students Overseas
GOSL	Government of Sierra Leone
IADP	Integrated Agricultural Development Project
IBRD	International Bank for Reconstruction and Development (also World Bank)
IDA.	International Development Association--soft loan window of the World Bank
laterite	reddish tropically weathered soil formed by the decomposition of the underlying rocks
MODEP.	Ministry of Development and Economic Planning
MOW.	Ministry of Works
OPG.	Operational Program Grant
PPC.	Bureau for Program and Policy Coordination (A.I.D.)
poda-poda.	light van or truck (usually Mazda) which transports people and produce
PVO.	Private Voluntary Organization
REDSO/WA	Regional Economic Development Services Office/ West Africa (A.I.D.)
rutile	a common mineral, titanium dioxide--TiO ₂ --occurring usually in crystals and used to coat welding rods.
VSO.	Voluntary Services Organization (United Kingdom)

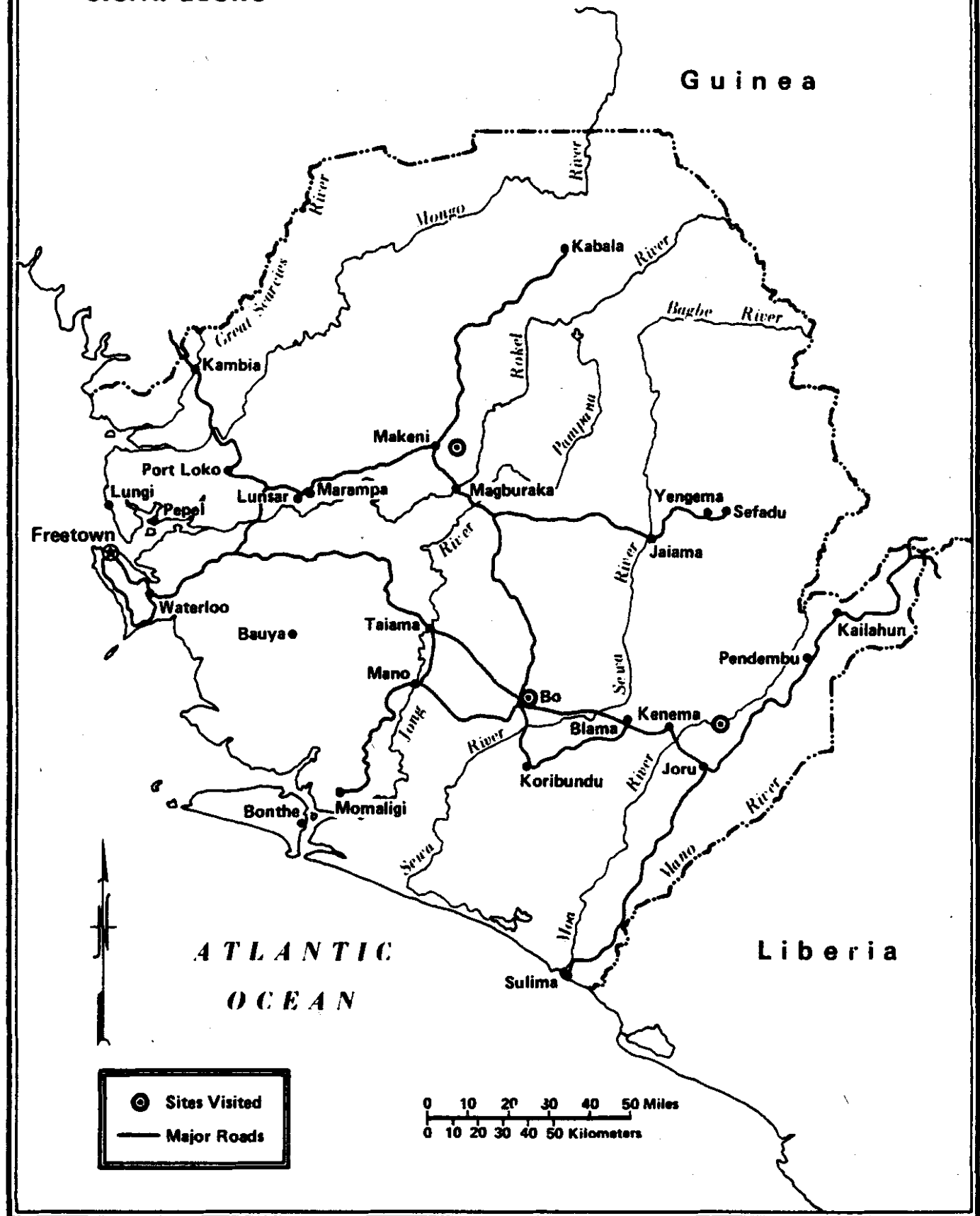
Currency Equivalent (7/79)

1 Leone.	\$.96
1.04 Leone	\$1.00



Map 2

Sierra Leone



**EFFECTIVENESS AND IMPACT OF THE CARE/SIERRA LEONE
RURAL PENETRATION ROADS PROJECTS**

I. PROJECT EFFECTIVENESS

After a number of years of dependence on declining mineral exports and in the face of a worsening balance of payments situation, Sierra Leone began to focus on agricultural development in the 1970's. The first of the CARE/Sierra Leone Rural Penetration Roads Projects began as a component of World Bank funded Integrated Agricultural Development Projects (IADP). Increasing the production of export crops such as cocoa and oil palm as well as rice were the main objectives of the Eastern IADP whereas the Northern IADP has concentrated on peanut, livestock, and rice production.

A. Implementation

Through 1980 the total cost of Phases I and II of the Rural Penetration Roads Project will have been \$11.7 million. AID has contributed \$5.1 million, about 44 percent of the total. If CARE had 102 miles of road in 1980, it will have contributed 102 miles of feeder roads in Sierra Leone under the same cost per mile of \$23,400 (\$14,500 per kilometer). Of the total miles of road constructed, 348 miles will be relatively high standard feeder roads, known as "Class IV" roads under Sierra Leone's road classification system. Because over 99 percent of Sierra Leone's 592 miles of Class IV feeder roads were found to be in "bad" condition in 1974, the project will increase by more than half Sierra Leone's feeder roads in good condition.

Construction of this 417 miles of feeder roads compares to projected construction of 1300 miles under both phases of the project. The principal reasons for construction shortfalls were:

- delays in AID funding which meant the loss of two out of six construction seasons;
- poor estimation by AID and CARE of the time necessary for the construction of relatively high standard Class IV feeder roads in Sierra Leone;
- higher than anticipated breakdowns of old construction equipment which was used early in the project; and
- the supply of volunteer engineers and technicians early in the project who did not have adequate skills.^{1/}

^{1/} As organizations like the Peace Corps have worked to provide volunteers with appropriate skills, the use of such volunteers has proven to be a wise choice.

Three annual evaluations by AID of the Rural Penetration Roads projects have concluded that CARE has performed satisfactorily in implementing the projects and has coped well with funding delays and other difficulties. CARE has involved significantly local chiefs and villagers in road construction and maintenance. This local involvement has reportedly led local people to identify the CARE roads as "their" roads. At the same time, a relatively more objective system of road selection has replaced the prior system which was completely political. The major weakness of the projects has been the failure to institutionalize a feeder road maintenance capability within the Government of Sierra Leone (GOSL) that would insure that the feeder roads would continue to benefit Sierra Leone.

B. Maintenance

Whether or not the CARE-constructed feeder roads will be maintained by the Ministry of Works (MOW) has been a persistent issue. The 1979 annual evaluation team observed that most of the non-CARE roads in Sierra Leone were in poor condition, and little indication of maintenance work on non-CARE roads was seen. Past evaluations had recommended that further funding of the Rural Penetration Road Projects be conditioned upon satisfactory GOSL action to maintain the CARE feeder roads. Consequently, the 1979 annual evaluation team spent considerable time in seeking and obtaining a governmental commitment to provide operating funds for maintenance of the portion of CARE feeder roads for which the GOSL was to assume responsibility in 1980. The GOSL allocated funding for maintenance of the first portion of the CARE feeder roads for three basic reasons:

- National political figures as well as local chiefs and Villagers regard the CARE Feeder Road Program as a success and wish it to continue.
- Sierra Leone's President has taken a personal interest in the feeder road program, in part because the CARE feeder roads are critical to the success of World Bank funded Integrated Agricultural Development Projects (IADP's). Existing and future IADP's are the primary means for Sierra Leone's planned agricultural development.
- Officials of the Ministry of Development and Economic Planning were willing to intervene in the budget process to increase MOW funding for CARE feeder road maintenance.

Therefore, a confluence of pressures made a number of actors and organizations in the Sierra Leone setting willing to take reasonable steps to provide funds for maintenance of the CARE feeder roads.

Although AID and CARE have had an initial success in insuring maintenance of the CARE feeder roads, it is uncertain that the GOSL

and its Ministry of Works will continue to maintain increasing mileages of these roads. For maintenance to continue, any Phase III of the CARE/Sierra Leone Rural Penetration Roads Projects should focus on building institutional capability within the GOSL for feeder road maintenance and construction.

II. IMPACTS

The basic purpose of the projects has been to support the World Bank financed IADP's in Sierra Leone by increasing access of small farmers to extension agents, fertilizer, improved seed, and market outlets. The available evidence indicates that the CARE roads, in conjunction with the IADP's have had both positive and negative impacts but that the positive outweighs the negative, at present. On both the positive and negative sides, relatively clear evidence exists on some points and relatively ambiguous evidence on other issues. ^{2/}

A. Positive Impacts

It is fairly clear that villages served by CARE roads receive more frequent visits by extension agents, both of the IADP's and of private companies--such as the Rokel Leaf Tobacco Development Corporation (RLTDC) and the Mobole Fruit Company. Likewise, the CARE roads have led to substantially increased traffic--although some CARE roads are carrying much traffic diverted from dilapidated, unmaintained trunk roads. CARE-affected villages are visited by more poda-podas (Mazda light vans providing local transportation for people and produce) and other vehicles. Inhabitants of villages served by CARE roads own more motorcycles and bicycles than persons living in communities without CARE roads. Because of the greater ease of transporting heavy items, CARE-affected villages use more cement in housing and building construction. Because of the greater ease of visits to market towns, inhabitants of communities served by CARE roads spend somewhat more of their increased income on basic consumer goods: umbrellas, plastic buckets, watches, radios, charcoal irons, and motorcycles or bicycles. Finally, CARE-affected villages benefit from more government and private health services than non-CARE affected villages.

It is less clear that the CARE roads are associated with other positive impacts. On certain agricultural practices--use of fertilizer and marketing a wider variety and greater quantity of crops--farmers in CARE-affected villages seem to be farther along than non-CARE affected villages, but the evidence is conflicting. In some instances and by some reports, more commercial activity--new rural markets, more commercial bank lending, new rice mills--is occurring along the CARE roads but the indications are not

^{2/} For more detailed discussion of impacts including supplementary tables, see Appendix A, Section IV.

sufficiently widespread or confirmed to support firm conclusions. Similarly, in some instances CARE-affected villages have more new construction and more schools than non-CARE affected villages, but again the evidence is not clear.

B. Negative Impacts

Although the passage of time may see a number of negative impacts of the CARE roads, at present clear evidence of negative impacts exists in only a few areas. In several additional areas, negative impacts are possible. Farmers in CARE-affected communities have generally reported a shorter range of fallow periods for rice cultivation than farmers not served by CARE roads. These phenomena of shorter fallow periods, more serious rice shortage and greater swamp rice cultivation would be consistent with the substitution of export crops (coffee, cacao, and oil palm) for food crops. Under this explanation, farmers planting more land in tree crops would replant upland rice fields after shorter than usual fallow periods or would plant their upland rice in more distant fields—possibly on steeper hillsides. More of such farmers would also shift to swamp rice cultivation, in spite of the preference for upland rice, in an effort to meet their food needs.

What is less clear is whether these shifts are causing more environmental damage—such as loss of soil fertility, increased soil erosion, and worsened deforestation—in areas served by CARE roads versus other areas. Increased firewood sales have been observed along CARE roads. This, combined with the evidence of shorter fallow periods and more scarcity of rice, suggests that the cash crop emphasis of the IADP's supported by the CARE roads may be exacerbating the loss of topsoil, soil fertility, and forest cover. To confirm these suspicions, certain questions should be answered: (1) are enough farmers shifting to swamp rice cultivation to relieve the downward pressure on upland rice fallow periods; (2) is it true, as argued, that expanded tree crop cultivation will reduce erosion? However, if farmers are shifting sufficiently to swamp rice cultivation to compensate for lower upland rice production, they may be increasing their exposure to malaria, schistosomiasis and other water-borne diseases. Further, the nutritional content of their families' diets may be declining because of the loss of crops traditionally intercropped with upland rice. The shift to swamp rice may also have adverse social impacts because upland rice farming has served a number of social functions. The evidence is not conclusive on these health and social impact questions, but enough indications exist to warrant serious investigation.

With regard to the CARE roads' effects on migration, the evidence is unclear. Communities with more children in school

do seem to experience more migration, but the increases in school attendance do not break down neatly between villages with and without CARE roads. On the basis of existing surveys, CARE-affected villages seem to be experiencing less migration than non-CARE affected villages. However, the effects of CARE roads on migration are probably related more to the degree to which the roads are serving a trunk or arterial road function—as some CARE roads in the Eastern IADP are doing—versus a feeder road function. Existing analysis of the impact of roads on migration indicates that trunk roads are associated with increasing rural-urban migration whereas feeder roads are not. 3/

In summary, the available evidence suggests that the CARE roads have had in the short run more positive than negative impacts. Additional investigation is needed to determine the importance of negative effects of the roads and whether positive impacts will outweigh negative effects.

C. What is Unknown About the Impact of the CARE Roads

At this time, a number of basic questions about the impacts of the IADP's and the CARE roads cannot be answered from the available evidence:

- Who is benefiting from the IADP's and the CARE roads—the relatively poor or the relatively well-off?
- Are traders and transporters benefiting more than agricultural producers from decreased transportation costs?
- In order to tell whether the roads are associated with greater production, what are the trends in total and per acre production of rice, coffee, cacao, and oil palm kernels in IADP areas served by CARE roads?
- What are the most fragile aspects of the agronomic system in the IADP areas? How are increased cash crop cultivation and diminishing fallow periods affecting soil fertility, erosion, and deforestation?
- What effects are the IADP activities and the CARE roads having on land values and land tenure?

3/ "Socio-Economic and Environmental Impacts of Low Volume Rural Roads: A Review of the Literature," by Devres, Incorporated, A.I.D. Program Evaluation Discussion Paper No. 7, The Studies Division, Office of Evaluation, Bureau for Program and Policy Coordination, February, 1980, p. 149.

- How has the role of women been affected by the IADP's and the CARE roads? Has greater ease of transporting produce to market enhanced or diminished marketing roles women previously performed? Has increased cash crop cultivation taken more of women's time so that they grow less of vegetables and other crops than they have traditionally added to their family's diet?
- Is increased incidence of schistosomiasis, malaria or other water-borne diseases occurring because of increased swamp rice cultivation? What new measures are necessary to control and treat these diseases?
- Are the roads and the IADP's associated with changes in the numbers and size of small rural businesses and industries which "generate both a higher output and a larger amount of employment per unit of the relatively scarce factor, capital"? ^{4/} What additional programs--such as basic management training, technical services, new rural credit institutions, or revised economic policies--are necessary to accelerate the rate of formation and growth of such rural businesses and industries?

As the above issues suggest, answering with any confidence the question of what socio-economic and environmental impacts the CARE roads have had requires an understanding of several systems within Sierra Leone: the rural economic system; the various tribal systems and their land tenure practices; the agronomic system; and the trading and transport systems.

The interrelationships within and among these systems will determine what the impacts of the CARE roads and the associated IADP's have been, will be, who will benefit, and whether negative impacts will outweigh positive effects.

III. CONCLUSIONS AND LESSONS LEARNED

A. Conclusions

1. Road construction and cost per mile estimates for both phases of the CARE/Sierra Leone Rural Penetration Roads Project were extremely overoptimistic. The project did not come close to achieving its projected construction or cost per mile targets in Phase I or Phase II.

^{4/} Carl Liedholm and Enyinna Chuta, "The Economics of Rural Urban Small-Scale Industries in Sierra Leone," African Rural Economy Paper No. 14, 1976, p. 123.

This is probably nothing new to aid donor-funded rural road projects. The principal causes of construction shortfalls and cost per mile overruns were AID funding delays; faulty assumptions by CARE and AID regarding the construction requirements of Class IV feeder roads; and experiments by CARE in using second hand equipment and volunteer engineers that caused problems early in the project. However, it should be emphasized that with better attention to CARE's needs by organizations supplying volunteers, the decision to use volunteer engineers has proven to be a wise choice that has lowered costs significantly.

2. CARE has constructed a satisfactory mileage of roads at reasonable cost. Given the GOSL insistence on the construction of Class IV roads and given AID funding delays, CARE has performed about as well as any organization could have performed in constructing through FY 79 314.7 miles of generally high quality rural roads (of which 246.3 miles are Class IV feeder roads). The projected cost per mile of the CARE roads of \$23,400 is quite reasonable, given the quality of roads stipulated. By the end of the project in 1980 CARE will have constructed or rehabilitated over 348 miles of Class IV feeder roads—an amount greater than half of Sierra Leone's total Class IV road mileage in 1974, (of which over 99 percent was in "bad" condition).

3. In the face of serious implementation problems, CARE has performed well. CARE has shown substantial innovation

- in using Peace Corps and other volunteer engineers;
- in involving significantly local chiefs and villagers in road construction and maintenance; and
- in helping the GOSL to institute a more objective process of and criteria for road selection.

4. The project has had mixed success in obtaining GOSL commitment to maintain the CARE feeder roads. CARE and AID, through effective use of the annual evaluation process, succeeded in obtaining a budgetary commitment by the GOSL to maintain the first portion of CARE roads which the GOSL takes over in FY 1980. Annual evaluations in 1977, 1978, and 1979, conditioned further funding on progress in maintenance. This led to the GOSL's planning, allocating personnel, and budgeting for maintenance of a part of the CARE feeder roads for 1980. Whether there will be longer term commitments is not yet known.

CARE and AID succeeded in obtaining a GOSL commitment on maintenance of the feeder roads because of three factors:

- the perception in Sierra Leone of the CARE Rural Penetration Roads Project as a successful program in building high quality feeder roads;
- the personal interest by Sierra Leone's President, the Honorable Siaka Stephens, in seeing the program continue because of the critical importance of the feeder roads

to the success of the Eastern and Northern IADP's and the basic importance of those projects to long-term improvement in the Sierra Leonean economy; and

--the willingness of officials of the important Ministry of Development and Economic Planning to personally intervene to insure funding for MOW maintenance of the feeder roads.

5. The project has failed to institutionalize feeder road construction and maintenance within the GOSL. Largely because a planned IBRD highway maintenance project was delayed, little progress has been made in insuring that maintenance of the CARE feeder roads will continue after the project ends. Although the GOSL has agreed to provide funds for the MOW to maintain the first 77 miles of CARE roads built in 1976 and 1977, serious questions remain on whether the GOSL will take over maintenance for additional portions of the CARE roads. Moreover, no progress is evident in institutionalizing rural feeder road construction within the GOSL.

6. A substantial shift occurred during the project from labor-based to equipment-based road construction. Unfortunately, AID and CARE did little to document this shift, presumably because there was little incentive for them to do so. Thus, one is left with no way of analyzing clearly the underlying reasons of the shift, although a high minimum wage, the absence of improved techniques for organizing and carrying out labor-based construction, and an unsatisfactory experience with a national system of labor-intensive maintenance were probably significant.

7. The overall socio-economic impact of the CARE roads at present has been positive. At the same time, questions exist concerning negative impacts, which over time, could overwhelm the positive effects. If one accepts the findings of socio-economic surveys carried out along the CARE roads, the roads are clearly associated with more frequent agricultural extension agent visits, increased traffic and transport services, higher quality cement construction in villages, higher purchases of consumer goods, and more health services in villages served by CARE roads. In addition, there are indications that the CARE roads have played some role in facilitating increased fertilizer use; in bringing about wider cultivation and marketing of cash crops; in expanding commercial activity; and in increasing educational opportunities.

On the negative side, socio-economic surveys and other investigation indicate that the CARE roads are associated with a shorter range of fallow period for upland rice cultivation, greater rice scarcity, and increased swamp rice cultivation. These conditions

suggest substitution of cash crops such as cocoa, coffee and oil palm for food crops, particularly rice. Some indications exist that the CARE roads, because of the above effects, are associated with decreasing soil fertility, deforestation, increased soil erosion and increased exposure of swamp rice farmers to water-borne diseases. The relationship of the CARE roads to migration is unclear. Since some CARE roads function as arterial or trunk roads connecting major provincial towns, those roads probably encourage migration whereas those CARE roads that function as true feeder roads, connecting villages to rural market towns, likely retard rural-urban migration.

B. Tentative Lessons Learned for Rural Roads Projects

Although obviously, one cannot draw lessons from one project experience that will apply generally to AID-financed rural road projects, it is useful to identify tentative hypotheses. These tentative lessons learned can be compared to findings of other rural road impact evaluations. A comparative analysis of the findings of a number of rural road impact evaluations will hopefully produce some general lessons for improved design and implementation of rural road projects.

1. Before funding rural road projects, AID should determine independently whether complementary activities--such as agricultural development or manufacturing--are likely to have predominantly positive or negative impacts. To a large degree, rural roads accentuate the prevailing tendency of development in an area. Before funding rural road construction, AID should ascertain that the agricultural development strategy the roads are supporting will benefit relatively poor people. In addition to any development projects going on in the area, AID should also be aware of the effects on small producers of (1) agricultural pricing policies, (2) the land tenure system, (3) rural credit policies and programs, and (4) policies affecting rural enterprises. This does not mean that massive, expensive, long-term studies should be carried out on each of these points but that persons knowledgeable about the country in question should be consulted on these issues and offer their advice on the likely effects of rural road construction and maintenance.

2. In design and implementation of rural road projects, AID should place major emphasis on institutionalizing maintenance of the roads as well as institutionalizing future rural road construction. In developing countries maintenance of feeder roads, not to mention highways, will be a continuing problem. AID should devise strategies for institutionalizing maintenance. Such strategies could include:

- involving local villagers and officials in selection, construction, and maintenance of feeder roads to insure local identification with the roads;
- insisting on explicit funding by LDC governments of operating expenses, personnel costs, and equipment depreciation for maintenance of feeder roads;
- tying feeder road construction to simultaneous agricultural development efforts that will result in expanding government revenues to fund recurrent costs;
- conditioning annual tranches of foreign aid funding of feeder road construction on adequate progress in maintaining previously constructed roads;
- providing career incentives for engineers, site supervisors, and work gang foremen to concentrate on maintenance.

To devise means of effecting such institutionalization, future rural road project evaluations should focus on why institutionalization of maintenance and construction occurred or did not occur.

3. In future grants to private voluntary organizations (PVO's) for rural road construction, AID should require explicit commitments by host governments to fund maintenance. A significant part of the problem in obtaining GOSL funding and action for feeder road maintenance may have been the absence of an explicit GOSL commitment, although it is difficult to argue that such a commitment would have been a sufficient condition for maintenance. The grant agreement committed CARE (but not the GOSL) to maintain the roads. When the expected IBRD highway maintenance loan did not materialize, AID seems not to have had any formal commitment on maintenance by the GOSL to fall back on. This lack of explicit commitments by LDC governments to support or maintain AID-funded PVO activities may be present in other PVO projects.

4. To document the immediate socio-economic impacts of rural road projects, AID should carry out periodic limited baseline and impact survey (perhaps annually) on a sample of new roads and on a set of roads previously constructed. Although the CARE Rural Roads Project is five years old, socio-economic surveys are still being carried out in areas where roads are yet to be built or have just been built. These surveys both define baseline conditions and, by use of a "with-roads without roads model," provide some indication of the impacts of the

roads. Further, after three years of surveying, the consultant has begun to investigate impacts of the roads over time in areas he has previously surveyed. These surveys have been relatively inexpensive (\$10-15,000 each) and could likely be substantially improved while still being a minor cost in the overall project. For many road projects (or other AID activities) AID or its contractor should be able to similarly identify local nationals or expatriates who could perform baseline and impact surveys at relatively low cost.

5. AID should institute budgetary and career incentives for AID employees, Missions, and Bureaus that make clear their interest in carrying out impact evaluation of AID-funded rural road projects. The AID Administrator's current interest in the first series of project impact evaluations is clear. Before an effective system of evaluation planning, baseline surveys, careful reporting on project progress, and use of local nationals for impact evaluation of rural road projects becomes a habitual part of AID's operations, however, institutionalized incentives for AID employees, Missions and Bureaus are needed. The Sierra Leone case, in which several annual socio-economic surveys have been done, seems to be an exception. Construction of the Upper Volta Rural Road project in the Eastern ORD has been delayed two years, and yet the baseline conditions of the areas to be affected have not been established. Few impact evaluations of AID rural road projects exist although substantial literature on the impact of rural roads is available.^{5/}

A strategy is needed to insert budgetary and career rewards into AID's programming and personnel system for individuals, Missions, and Bureaus that excel in documenting both positive and negative impacts of projects. A first step could be peer review of the 20-30 impact evaluations being conducted in FY 80 of projects in several functional areas with appropriate rewards for Bureaus or Missions with the most successful projects and for evaluation teams which produce the most useful discussion of positive or negative impacts of a project. Rewards could include program incentives such as increased funding and individual incentives such as awards, commendations, promotions or step increases. Developing a full-blown strategy to institutionalize incentives for impact evaluation within AID would require substantial thought. However, attention to budgetary and career incentives seems critical to success.

^{5/} See "Socio-Economic and Environmental Impacts of Low-Volume Rural Roads: A review of the Literature," Devres, Incorporated.

6. Make widespread use in project designs and in regular rural road project evaluations of the device of conditioning future project funding on satisfactory maintenance by host governments of the roads constructed. The 1978 evaluation of the CARE project clearly recommended no further funding unless satisfactory progress was made on the maintenance question. This led the 1979 AID evaluation team to continually emphasize this point with GOSL officials. Since this position seemed to be determined by forces outside the control of the evaluation team, (i.e., the previous year's evaluation, in which none of the members of the 1979 evaluation team had participated) the pressure for action may also have appeared less heavy handed to GOSL officials. Strong interest in continuing feeder road construction throughout the GOSL was also important in obtaining government action on feeder road maintenance. Such interest in road construction, a traditional tool for pleasing local constituencies, is likely to be present in most developing countries and could be used to advantage.

C. Lessons Learned for Impact Evaluations

Attempting to ascertain the impact of the CARE Rural Penetration Roads Project has suggested a number of lessons for similar evaluations:

- send a team with a single purpose, with an independent ability to question beneficiaries and collect information, and with the necessary mix of expertise.
- allow sufficient time for preparation, field work, and writing the report.
- provide adequate administrative support.
- as soon as a series of evaluations begin in a particular sector or sub-sector like rural roads, develop practical methods of analyzing major impacts of that type of project--such as changes in income and income distribution, the role of women, land values and land tenure, migration, and rural commercial activity. Devise means of quickly training individuals in these methods.

1. Send an impact evaluation team with a single purpose, with an independent ability to question beneficiaries and collect information, and with the necessary mixture of skills.

Adding one person to an annual evaluation team is not a feasible way to study project impact. For this Sierra Leone report, a PPC/E staff person was sent both to participate in a regular evaluation of the CARE Rural Roads Project and to gather information for a

separate report on project impact. The PPC participant found himself confined, in practical terms, to the regular evaluation team's itinerary and agenda. Moreover, an annual evaluation's principal concerns are those of effectiveness, not impact.

To carry out an impact evaluation requires that the team have an independent capability to interview beneficiaries and collect other information. In this case it was thought that much of the information needed on the project impact had already been collected. But the existing socio-economic surveys had so far been more oriented toward developing baseline data. Further, a number of major issues--such as the impact of the CARE roads on land values, the role of women, and small-scale enterprises--had not been investigated.

An impact evaluation team requires the necessary mix of skills. For a rural roads project, one team member should have knowledge of transportation economics, road construction and road maintenance. The team requires knowledge of the country and particularly, the rural economic, agronomic, and social systems--ideally, through a sociologist or anthropologist with field work experience in the country and who speaks local languages. The team should also include expertise in agricultural economics or rural development of the region; a person capable of analyzing institutional and organizational questions related to the quantity, quality, and institutionalization of construction and maintenance; and a person able to analyze the effects of various macro-economic policies on the impacts of the roads. Some members of a team should be flexible enough to handle more than one of these areas, so that the team is not too large.

2. Provide the team with sufficient time to prepare, conduct their study, and produce a useful report. Preparation before departure involves--

- reading and digesting project papers and previous evaluations;
- consulting country experts to identify the critical impact issues to be addressed;
- meeting together as a team to decide how to go about the evaluation; and
- preparing brief lists of questions for farmers, women, truckers, traders, small businessmen, craftsmen, and government officials.

This preparation requires at least one week and probably more. That one-week estimate assumes that background material will have all been collected beforehand; that country experts will

be brought in for consultation if not to be team members; and that travel authorizations, cash advances and airplane reservations will be handled without significant involvement of team members.

It may be possible to complete in-country field work in four weeks:

--one week for proforma calls on Ministry officials, investigation of organizational questions within the public works Ministry, gathering of macro-economic data on certain issues such as crop production and migration, and illumination of the country's overall economic conditions.

--two to three weeks in the field to observe the state of the roads, take traffic counts, and interview small farmers, transporters, traders, and others on the impacts of the roads. This does not allow time for sickness of team members, vehicle breakdowns and other inevitable difficulties.

--one week for preliminary drafting of the report, Mission comments and review for factual accuracy, and a final attempt to fill holes in the analysis.

Allowing four weeks in-country still assumes that substantial advance preparation will have been made, particularly the identification of local students or others who can help in interviewing beneficiaries and in carrying out traffic surveys.

After returning to Washington, team members must be able to work away from their offices to prepare their draft report. A minimum of two weeks is likely necessary for this stage if they spend full time in writing their report and substantially more if they must write their report and carry their office workload at the same time. Then the draft must be circulated for comments, revisions made, and a final draft prepared.

By this reckoning, the time required for preparation, field work, and report preparation is seven to eight weeks. This estimate allows relatively little time for actual site visits and interviewing of beneficiaries, given difficulties in arranging and carrying out such visits so as to gather essential information. This estimate also assumes substantial administrative support for the team and the absence of illness, vehicle breakdowns, and other serious (but likely) difficulties.

3. Provide adequate administrative support so that teams can concentrate on the evaluation instead of the paperwork of traveling.

The current support for such teams is inadequate. AID support services such as the travel offices are inadequate and understaffed.

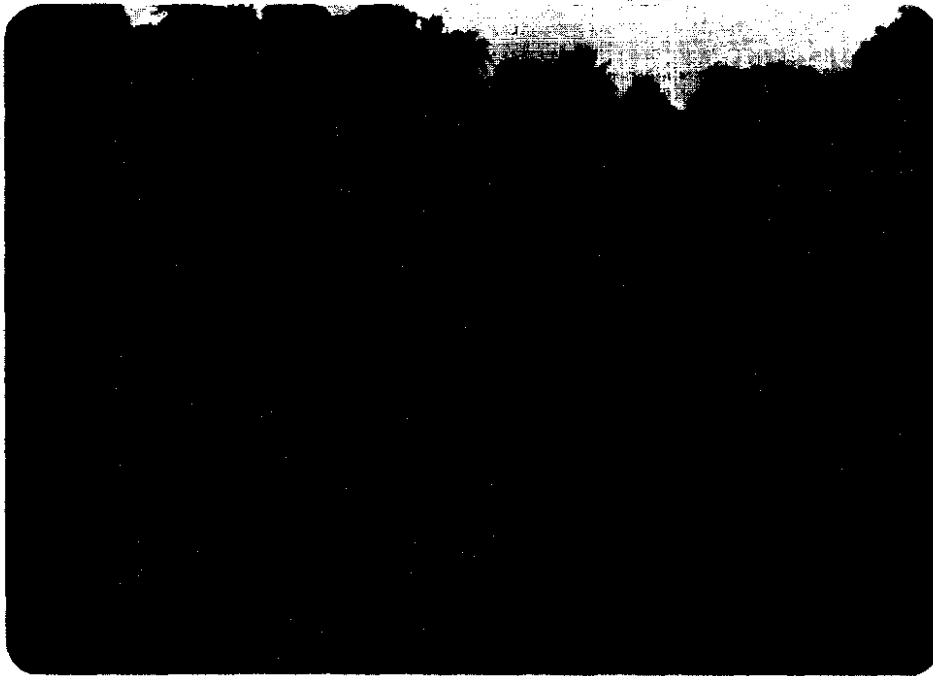
Clerical support is scarce. Evaluation team members must therefore spend significant time nursing through the system travel authorizations, cash advances, airline reservations, and purchase orders for country experts being brought in for the teams. Few if any word processing systems are available for producing quickly multiple drafts and re-drafts of impact evaluations. Producing sufficient copies of background information and evaluation reports takes an inordinate amount of time because duplicating equipment is scarce and the existing machines are not working much of the time.

4. Develop fast reliable methods and rules of thumb in assessing the impacts of rural roads projects. Devise a strategy to create a demand throughout AID's field Missions and Washington offices for the results and lessons learned of impact evaluation. Impact evaluation of development projects in general and rural roads projects in particular is new and difficult. Methods for such rapid investigation are scarce. Building on the experience of evaluation teams and the work of other experts, AID should identify the most essential questions to be answered concerning the impacts of rural roads projects. It then should devise techniques for identifying rapidly the impact of rural roads in these basic areas--such as changes in income, land ownership, income distribution, migration, the role of women, and agricultural production. AID should then train impact evaluation team members in the use of these techniques.

As evaluation teams return, they should be interviewed and debriefed systematically to gather information on (1) problems they encountered; (2) innovative solutions they developed for logistical, administrative, and substantive problems they encountered; and (3) specific issues they have identified whose investigation requires new study techniques. As part of a comparative report on rural road evaluations, a practical manual on evaluating the impacts of rural road projects should be prepared.

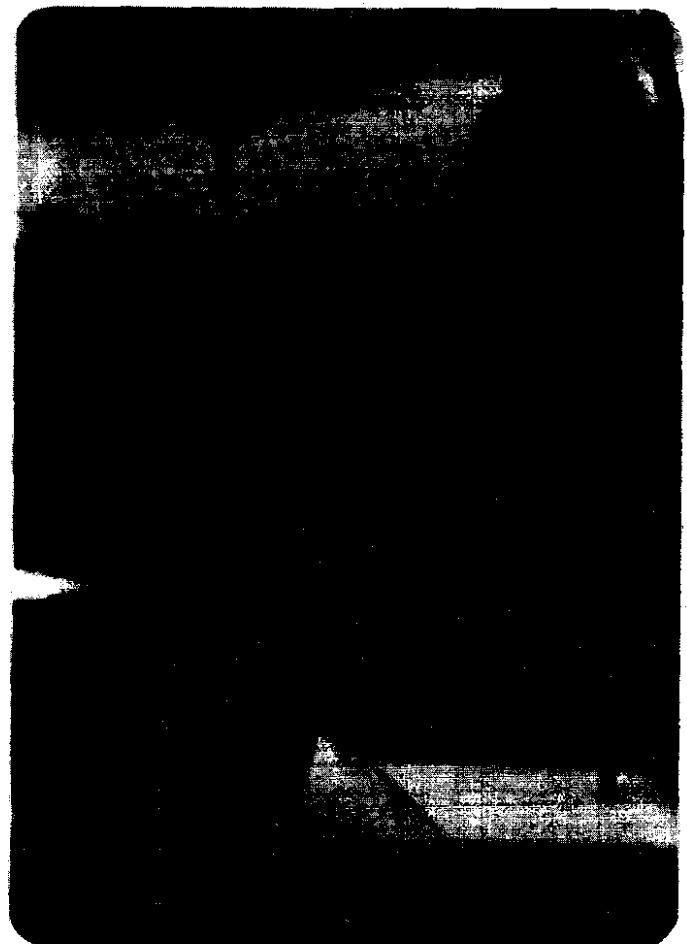
If the impact evaluations are to play a role in improving the impact of AID-financed rural road projects, the recommendations and lessons learned from these reports must be circulated to all those involved with rural roads projects. More than distribution is needed, however. Incentives must exist for Missions and individuals to utilize the lessons learned. AID should institute budgetary and career incentives which make clear to Bureau chiefs, Mission Directors, and employees that evaluating the impact of rural road projects and utilizing the findings of such evaluations is important to their careers and to their budgets.

APPENDIX A
PHOTOGRAPHS

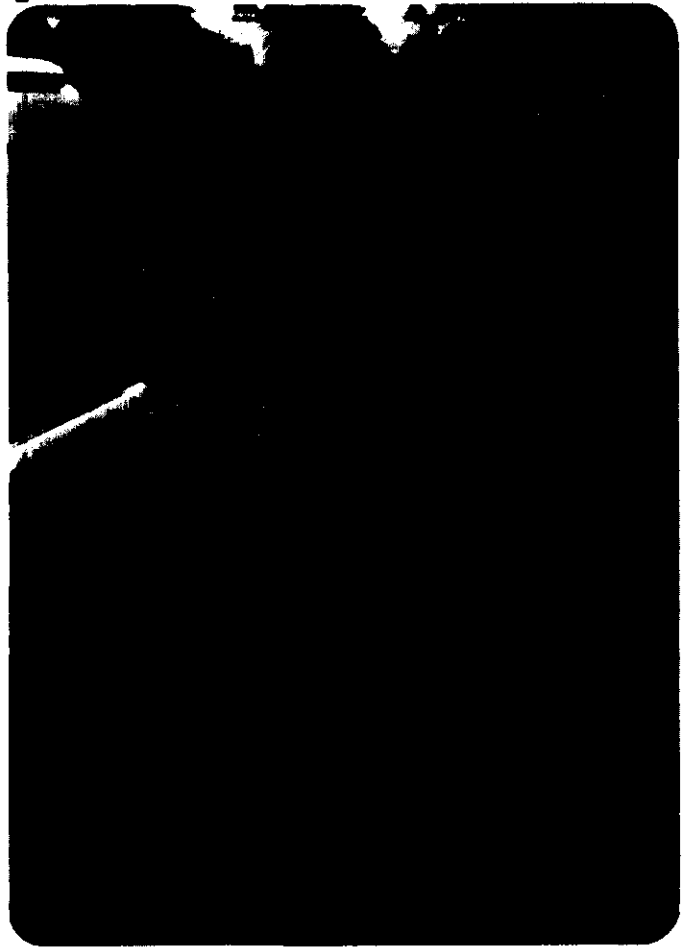


1. July 12, 1979. Main Trunk Road--Makeni-Bo.

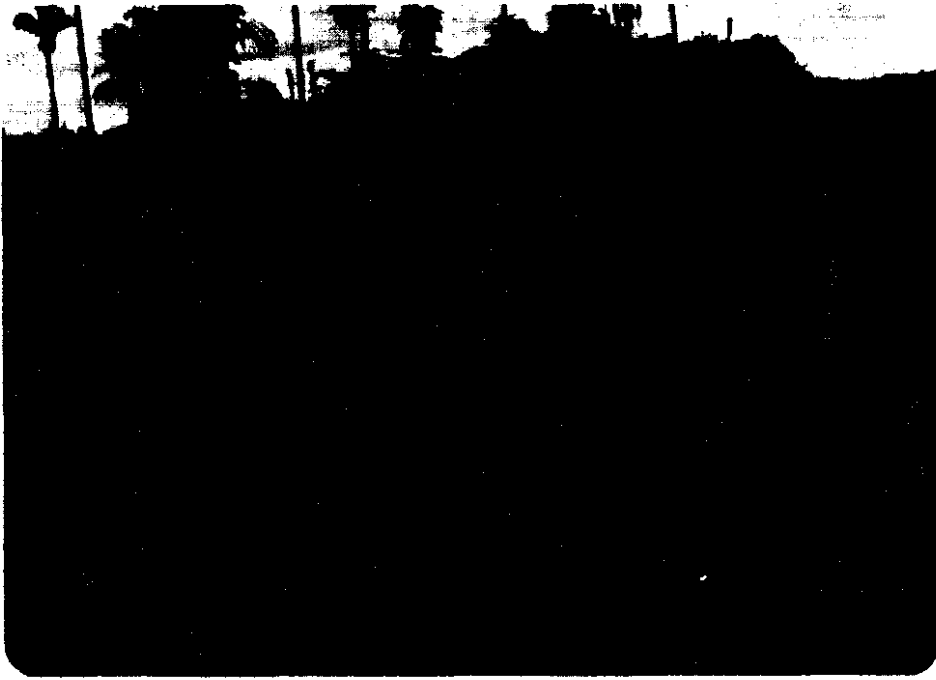
2. July 12, 1979. A
poda-poda on the
Makeni-Bo trunk road.
Note lack of drainage
ditches at side of
the road which means
rapid water damage
will occur.



3. July 12, 1979.
Damaged palm log
bridge on Makeni-Bo
trunk road.

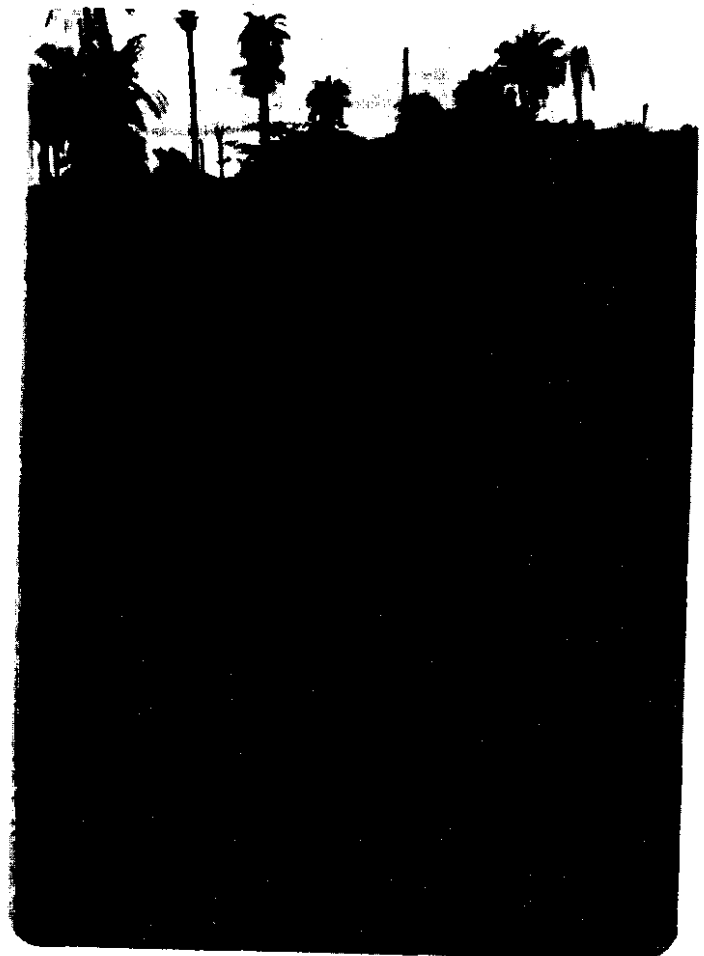


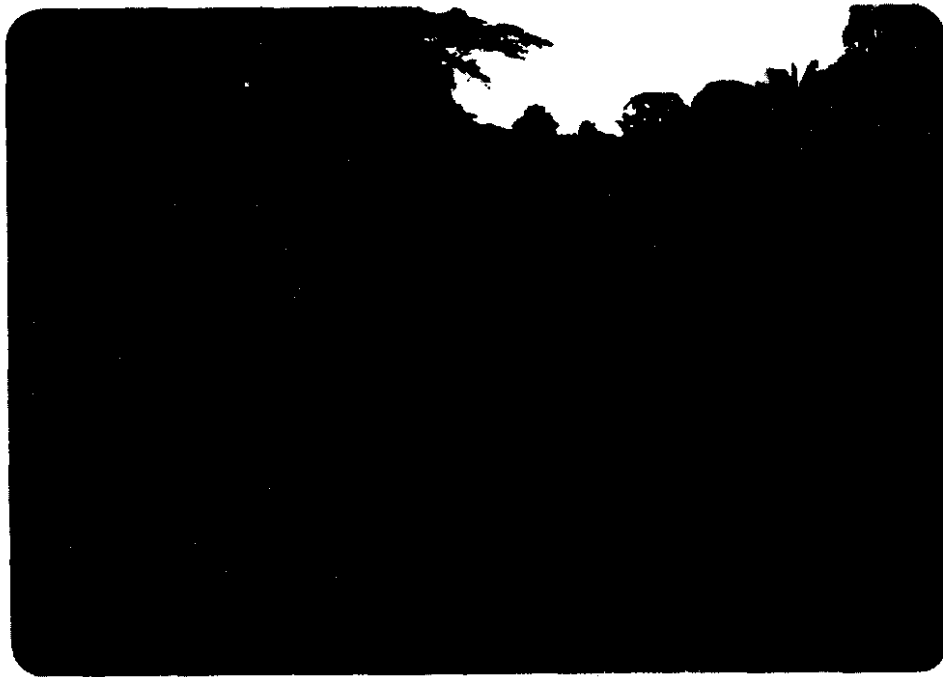
4. July 12, 1979. Makeni-
Bo trunk road after
a shower. Because of
the lack of maintenance,
drainage ditches have
been overgrown and crown
slope of road has dis-
appeared. The rains
are causing longitudinal
erosion.



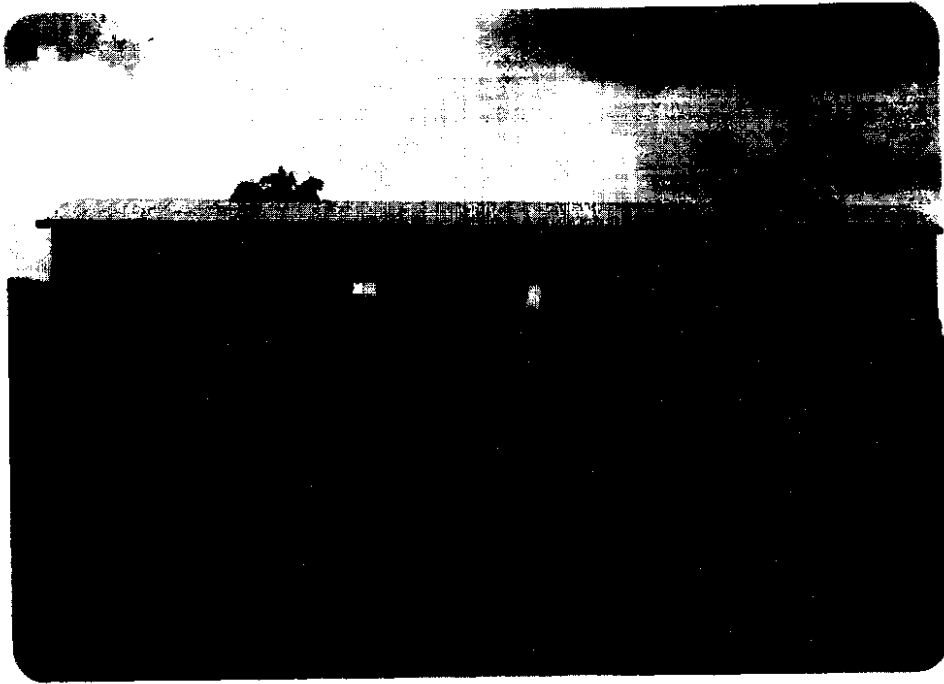
5. July 12, 1979. Newly built CARE feeder road in Makeni area. Note height of embankment and drainage structures. Water will run off evenly from this surface.

6. July 12, 1979. Newly built CARE feeder road in Makeni area. Some transverse erosion on road edge. Note height of embankment and drainage ditch.





7. July 12, 1979. Newly constructed CARE road in Makeni area. Steep side slopes have been seeded with grass to help prevent erosion.



8. July 12, 1979. Newly constructed primary CARE health center at convergence of two newly built CARE feeder roads in Makeni area.



9. July 13, 1979. Eastern IADP area near Kenema; field cleared for cultivation.

APPENDIX B
DETAILED REPORT

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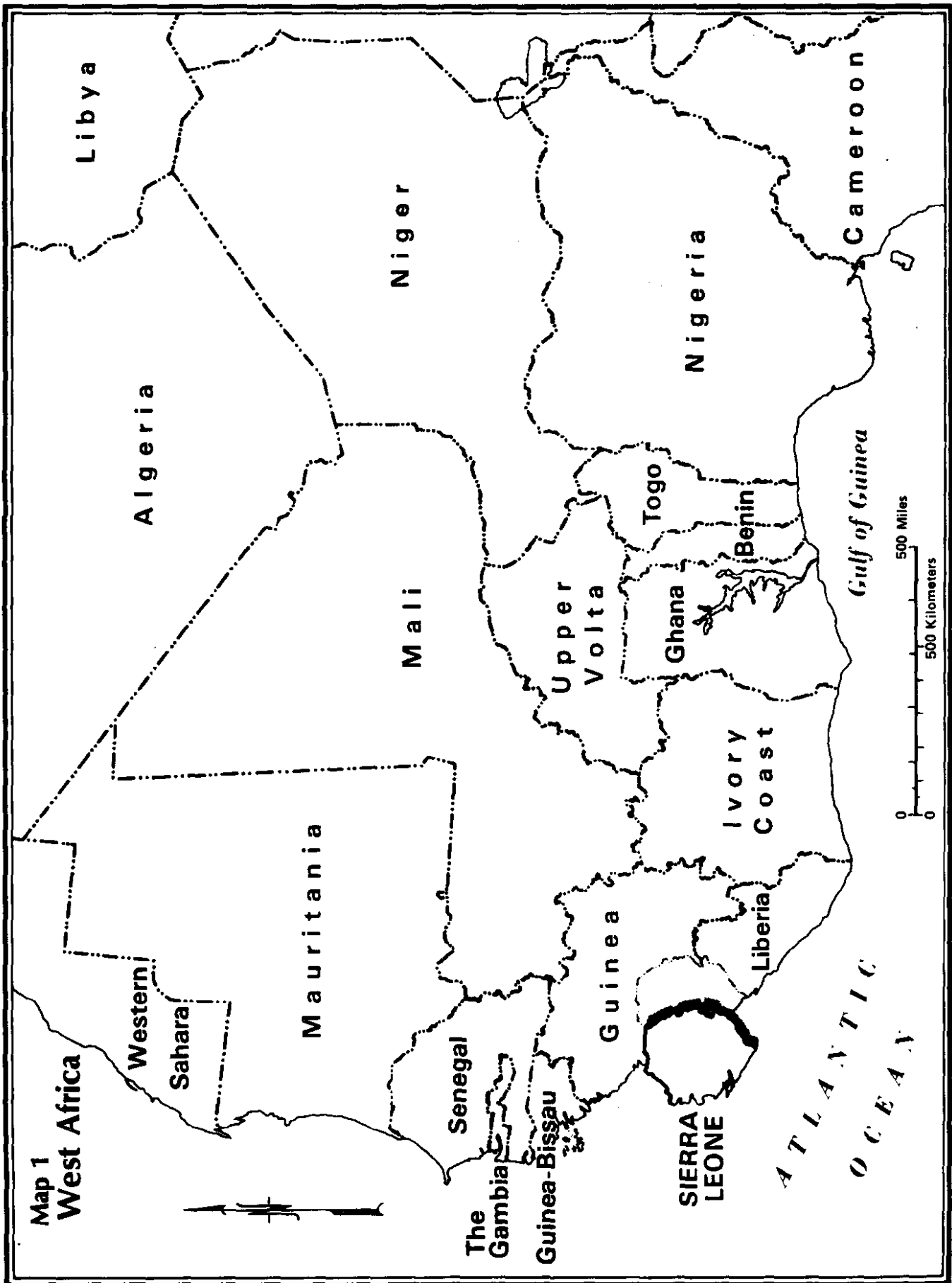
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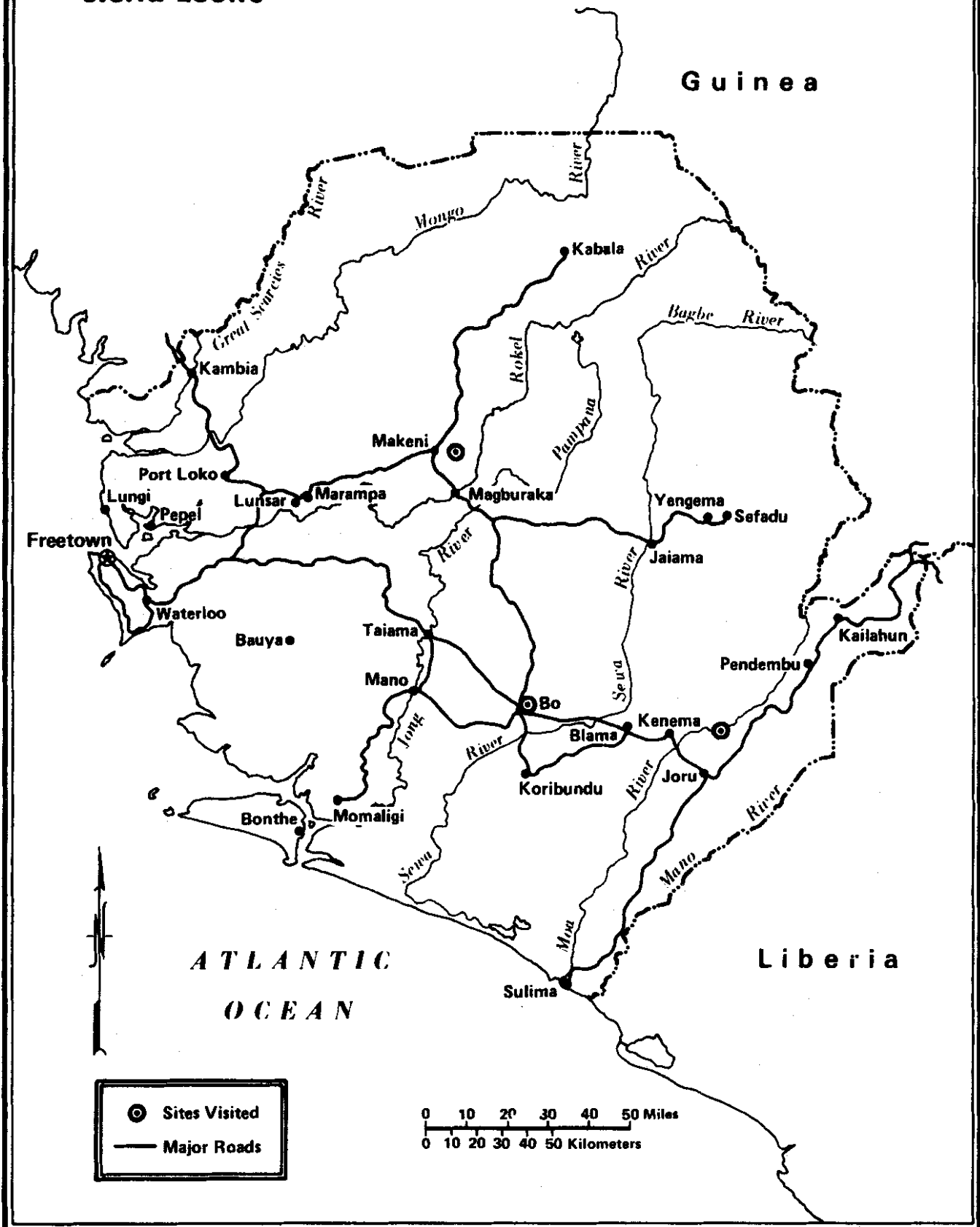
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Map 2
Sierra Leone



I. THE CONTEXT AND THE PROBLEM

A. The Sierra Leonean Economy

Sierra Leone, with a population of 3.1 million and a population growth rate of 2.5 percent, has an estimated per capita GNP of \$200. Although Sierra Leone's per capita GNP in current value has increased from \$140 in 1970 to \$200 in 1977, GNP per capita in real terms has fallen. Declining mineral exports, a widening budget deficit, and heavy external debt service payments characterize Sierra Leone's economic situation.

In the early years after independence (in 1962), the Sierra Leonean economy expanded at the rate of about 5 percent, primarily because of the increasing value of its major mineral exports--diamonds, iron ore, rutile, and bauxite. However, in the 1970's, mineral production and exports began to decline. Alluvial diamond deposits were being depleted. The one iron ore mine closed and rutile production was interrupted. Bauxite production continued but did not compensate for the other decreases. From about 1972 on, growth in gross domestic product (GDP) was about 1 percent, substantially less than the estimated population growth of 2.5 percent per year.

During this period, the national budget and the balance of payments have moved more and more into deficit. Because the Government of Sierra Leone (the GOSL) has increasingly financed its budget deficit through the domestic banking system, inflation has increased to a currently estimated rate of 30-35 percent. Expansionary fiscal and monetary policies have exacerbated the country's Balance of Payments position. Scheduled external debt service payments for 1979 amount to 30 percent of export earnings and more than one-third of government revenues. Sierra Leone received balance of payments support from the IMF in 1977 combined with a rescheduling of debt repayments; however, the country's balance of payments situation continued to deteriorate. There is currently a severe foreign exchange shortage, which has necessitated more stringent import controls. Because of its recent reliance on short-term suppliers credits, Sierra Leone faces a substantial bulge in debt repayments over the next several years and already is in arrears on some principal and interest repayments, mostly on private suppliers' credits. Sierra Leone is currently negotiating with the IMF on additional debt relief. When concluded, an agreement could open the way for increased concessional aid through the World Bank and other donors, whose assistance has been delayed because of IMF pressure on Sierra Leone for significant reforms in economic policies.

A final complication in the Sierra Leonean economic picture has been the GOSL's preparations for hosting the Organization of African Unity's (OAU) annual conference in 1980 in Freetown, the capital of Sierra Leone. Government funding for hotel and conference center

construction, park improvements, and other OAU preparations will total over 100 million Leones (\$96.2 million) in 1979 and 1980 (compared to total estimated revenues in 1979 of 147.8 million Leones).

B. Origin of the IADP Projects

As mineral exports declined during the 1970's the GOSL with the assistance of various aid donors, attempted to expand production of cocoa and coffee, its major traditional export crops, and production of rice, the principal food crop. These efforts also included diversification into other agricultural products, such as palm oil and peanuts. Expansion of agricultural production was to occur as Integrated Agricultural Development Projects (IADP's) provided farmers with improved crop varieties, fertilizer, extension advice, and better marketing services. The International Development Association (IDA, the soft-loan window of the World Bank Group) funded the first IADP in December, 1972. This Eastern IADP was to cover a substantial part of Sierra Leone's Eastern and Southern Provinces. A second IADP was funded by IDA in 1975 for part of Sierra Leone's Northern Province. See Map 3 for the location of the two IADP's. Both IADP projects aim at helping small farmers increase swamp rice cultivation (cultivation of traditional paddy rice in valley swamps) and at providing smallholders with improved varieties for upland rice cultivations. In addition, the Eastern IADP focuses on increasing cocoa and oil palm production. The Northern IADP is increasing groundnut cultivation and plans to introduce livestock production.

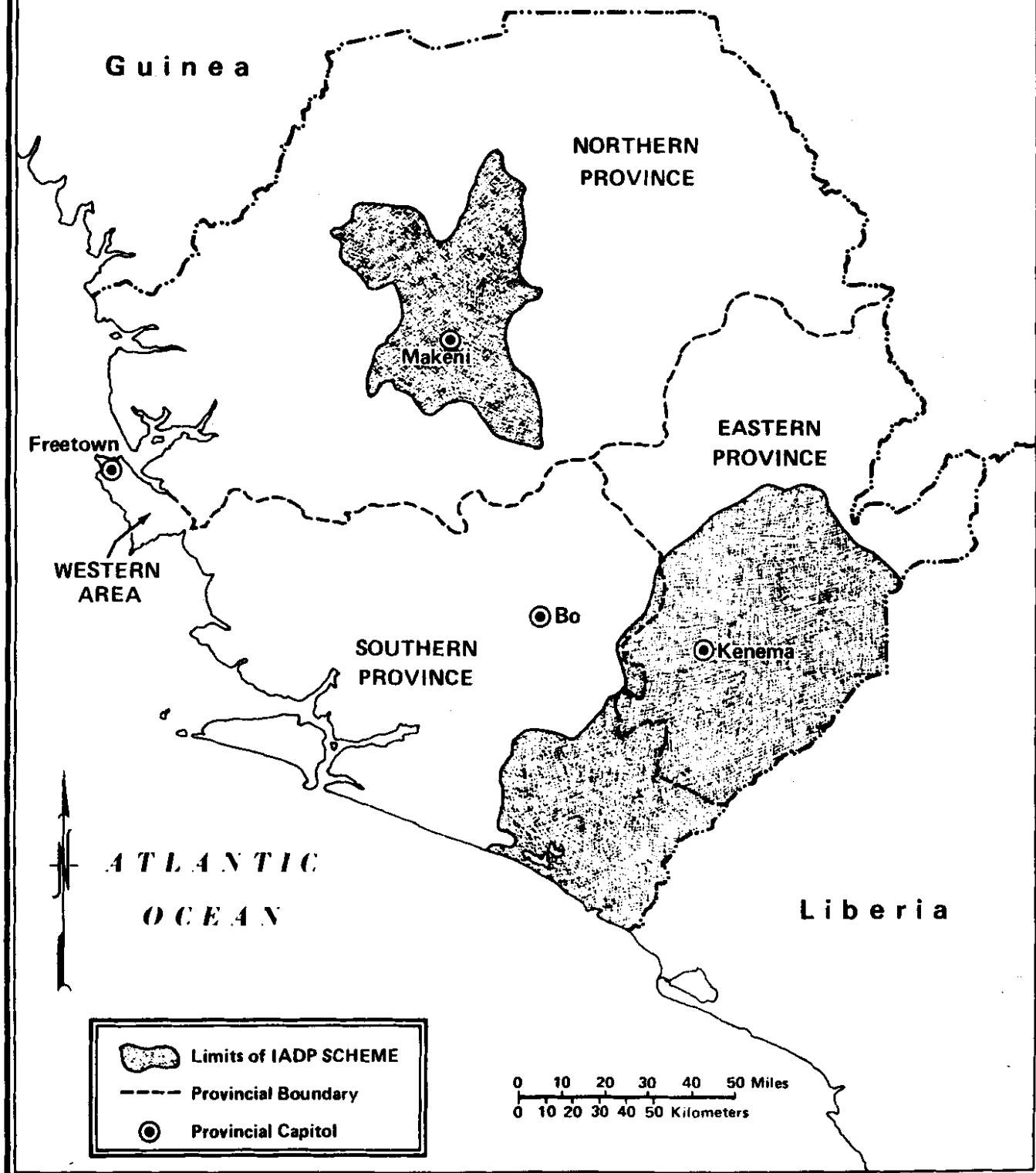
C. The Feeder Roads Project

As the Eastern IADP project began, it was realized that a lack of all-weather penetration or feeder roads in the area would seriously hamper the delivery of agricultural inputs and extension advice to farmers (much of which takes place during the rainy season). Lack of roads could also hinder the marketing of increased production from the area. CARE, AID, and other aid donors were contacted, and a program for construction of penetration of feeder roads in the Eastern IADP area was designed.

1. Project Purpose, Costs, and Outputs

The main purpose of the CARE Rural Penetration Roads Projects was agricultural development:

Map 3
IADP Location Map



To provide farmers in the eastern, southern and northern areas of Sierra Leone with increased and continued access to agricultural inputs (extension, fertilizer, improved seed) and market outlets.^{1/}

The first Phase of the CARE Rural Penetration Roads Project (also known as the CARE Feeder Roads Project) was funded in FY 1975 - FY 1977 for a total of \$3.2 million (the AID contribution was \$1.146 million). The need for similar roads in the Northern IADP, combined with lower road construction mileage than anticipated led to a second Phase of the project for the period FY 1978 - FY 1980 and total funding of \$8.5 million (AID--\$3.99 million). Table 1 indicates the resources provided by each donor over both phases of the program (the figures for Phase I and actual contributions and the Phase II amounts are the projected figures for the second phase). AID has contributed the largest amount, over two-fifths of the total project cost. CARE and the GOSL have provided 22 percent and 20 percent respectively.

As this project has evolved, one of the roles CARE has played is as a construction contractor. CARE has received funds and equipment from the GOSL, CARE itself, AID, and other contributors; has hired personnel; and has moved ahead to design, construct, or rehabilitate the roads selected. But, in addition to this traditional role as a construction contractor, CARE has assumed certain developmental functions, as will be discussed later (see Section II, A-C).

As CARE encountered delays in project funding (especially from AID), higher earth-moving requirements than anticipated, and other unanticipated costs and difficulties, total road construction mileage fell far short of projections. Table 2 compares projected road construction versus actual construction for FY 1976 - FY 1980. As indicated by the table, roads constructed in Phase I were expected to total 900 miles over three years. Instead, only 174.4 miles were built. In Phase II, CARE was expected to construct 400 miles of roads. Instead, the maximum amount of roads CARE could construct in the second phase is 242.3 miles. Moreover, that total assumes 102.0 miles of construction in the next construction season of FY 1980. Maps No. 4 and No. 5 indicate the locations of the roads already built or to be constructed in the Eastern and Northern IADP's, respectively.

^{1/} CARE Rural Penetration Roads II Operational Program (OPG) Proposal prepared by USAID/Liberia (submitted to AID, July 29, 1977), pg. 10. The project paper for Phase I of the project stated the same basic purpose. The project numbers referring to the funding for the projects are 636-0101, 636-0111, 636-0126.

Table 1. CARE/Sierra Leone Rural Penetration Road Program--
by Donor (in \$000's)

Donor	Actual Funding Phase I	Projected Funding Phase II	Total--both Phases
USAID	\$1,145.8	\$3,991.0	\$5,136.8 (44%)
CARE	778.9	1,793.1	2,572.0 (22%)
GOSL	1,093.8*/	1,200.8	2,294.6 (20%)
Peace Corps/ VSO	180.8	337.5	518.3 (4%)
IBRD/IDA		1,198.9	1,198.9 (10%)
TOTAL	\$3,199.3	\$8,521.3	\$11,720.6

*This represents the actual GOSL contribution in Phase I which was lower than the planned contribution because of extreme exchange rate fluctuations and loss of one construction season.

Sources: (1) Evaluation, CARE/Sierra Leone Rural Penetration Roads I (Grant No. AID/afr-G-1154), USAID/Monrovia, March, 1977, pp. 26-29; (2) Evaluation, CARE Rural Penetration Roads II (OPG/afr-G-1400; Project Number 636-0111), USAID/Liberia, November, 1978, pg. 30.

Table 2. Projected and Actual Road Construction by Year
(in Miles)

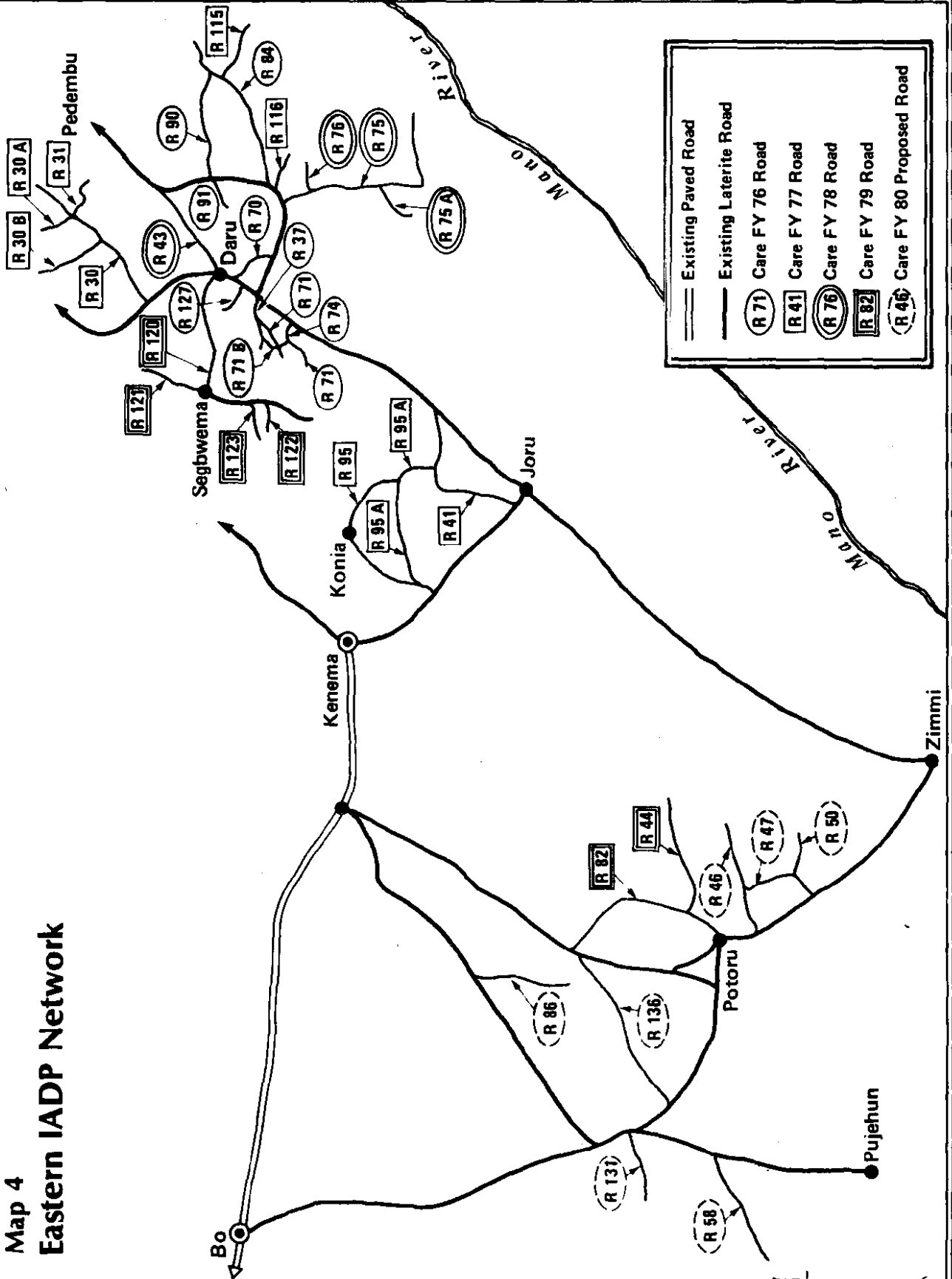
Fiscal Year	Projected Construction	Actual Construction; Class IV Roads	Actual Construction; Other Roads ^{*/}	Actual Construction; Total
FY 1975	130			
FY 1976	475	55.9	41.5	97.4
FY 1977	295	64.3	12.7	77.0
PHASE I TOTAL	900	(120.2)	(54.2)	(174.4)
FY 1978	133	54.6	8.5	63.1
FY 1979	133	71.5	5.7	77.2
FY 1980	133	102.0**	0	102.0
PHASE II TOTAL	400	(228.1)	(14.2)	(242.3)
PHASE I & II TOTAL		348.3	68.4	416.7

*"Other roads" were so-called "political" roads outside of the IADP's and selected by other criteria than is used by the Feeder Road Coordinating Committee. CARE construction on these roads involved structures only (mainly drainage culverts).

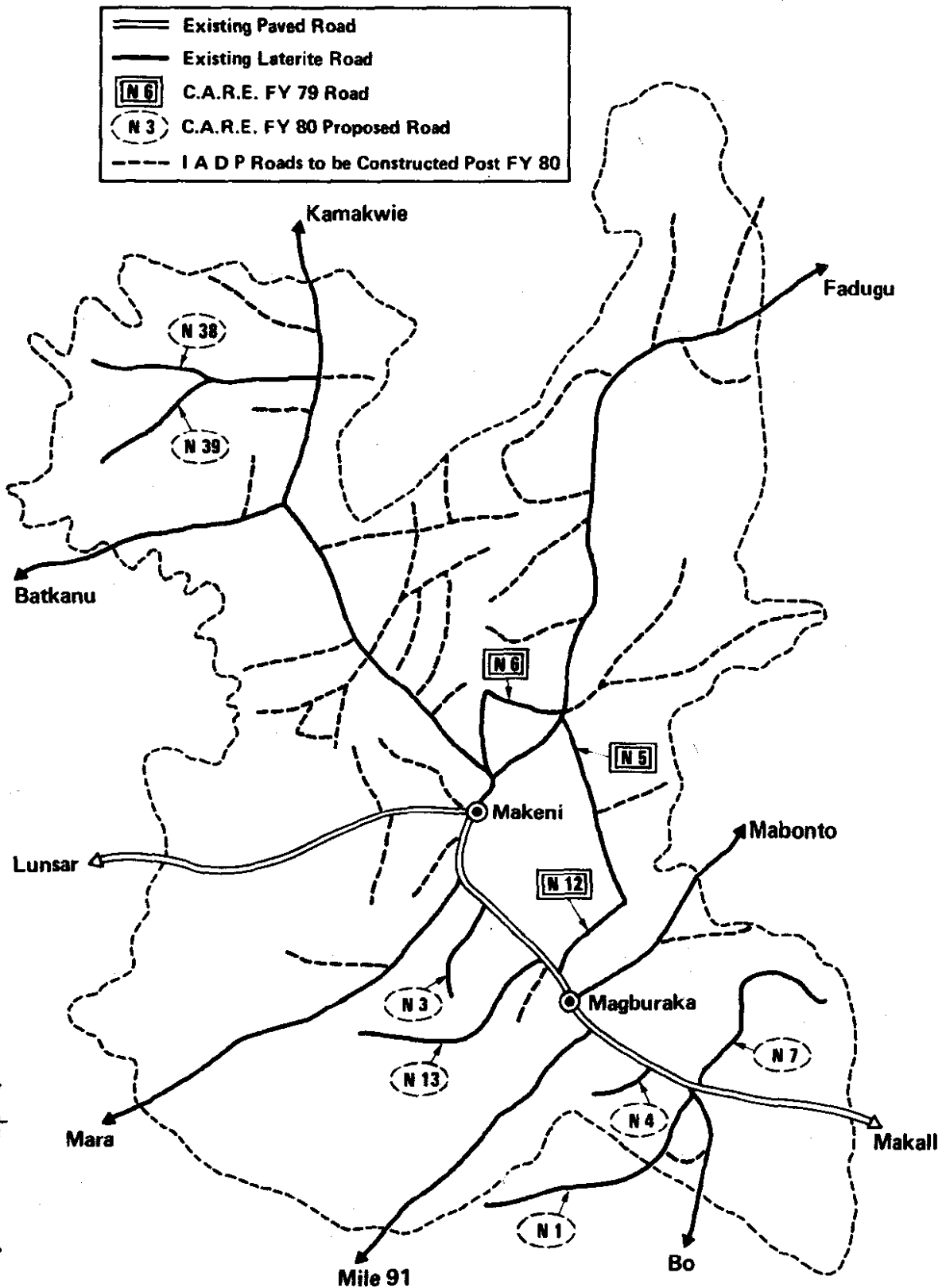
**This figure represents projected construction for FY 1980.

Source: CARE/Sierra Leone and AID evaluations, FY 77 - 79.

Map 4
Eastern IADP Network



Map 5
Northern IADP Network



In spite of construction shortfalls and other difficulties, the CARE Feeder Road Program has improved significantly Sierra Leone's road network. Table 3 shows the miles of existing road in Sierra Leone in each class and their condition at the time of a 1974 survey. If CARE meets its 1980 construction objective of 102 miles, total construction of Class IV roads under both phases of the project will have substantially increased Class IV road mileage in good condition. CARE will have constructed or rehabilitated 348.3 miles of Class IV feeder roads or more than half of Sierra Leone's total Class IV road mileage in 1974.

2. Project Staff

In May, 1979 at the end of this year's construction season, CARE project personnel totaled 500 persons of whom 486 were Sierra Leonean. Although Table 4 indicates that a significant number of higher level jobs are held by expatriates, CARE has moved Sierra Leoneans gradually into higher level jobs. In April, 1979, a Sierra Leonean became the project manager. This total of 500 employees does not include voluntary village labor provided for various construction and maintenance tasks.

3. Road Selection

Decisions on which road alignments are to benefit from the project are made in a two-step process. First, the IADP in cooperation with the local CARE construction engineer identifies road alignments for construction which (1) are over three miles long; (2) would serve, from the IADP's point of view, a priority agricultural area; and (3) would benefit the greatest population. If these alignments can be brought to Class IV standards at a reasonable cost, these choices are sent to the Feeder Road Project Coordinating Committee. This committee, formed in 1976 to depoliticize the selection process, is composed of the following members:

- The First Vice President of Sierra Leone (ex-officio Chairman)
- Ministry of Development and Economic Planning (The Permanent Secretary)
- Ministry of Works (Chief Engineer Highways)
- CARE (Director or Project Coordinator)

Table 3. Road Inventory for Sierra Leone--1974
(in Miles)

Class of Road	Paved	Laterite	Total
Class I - Principal Arterials			
Good	245.7		245.7
Fair	167.2	141.1	308.3
Bad	14.5	286.3	200.8
TOTAL	427.4	427.4	854.8
Class II - Minor Arterials			
Good	43.4		43.4
Fair	47.0	379.5	426.5
Bad	57.6	481.5	539.1
TOTAL	148.0	861.0	1,009.0
Class III - Collector Roads			
Good	0.4		0.4
Fair	18.2	103.1	121.3
Bad	9.9	1,691.6	1,701.5
TOTAL	28.5	1,794.7	1,823.2
Class IV - Local Roads			
Good			
Fair	4.8		4.8
Bad	0.1	587.2	587.3
TOTAL	4.9	587.2	592.1
All Roads			
Good	289.5		289.5
Fair	237.2	623.7	860.9
Bad	82.1	3,046.6	3,128.7
TOTAL	608.8	3,670.3	4,279.1

Source: "Proposed Four-Year Highway Maintenance Program," Ministry of Works, Government of Sierra Leone, prepared by Roy Jorgensen Associates, Inc., under auspices of the UN Development Program, January 1975, p. 14 (Table 2-1).

Table 4. CARE Project Personnel--May, 1979

Type of Personnel	U.S.	U.S. & UK	Local	Third Country
Project Coordinator	1			
Project Manager			1	
Asst. Project Manager			1	
Senior Site Engineer				
Maintenance Engineer		3		
Site Engineer		4	7	
Mechanical Engineer		5	3	1
Support Staff			474*	
TOTAL	1	12	486	1

*Support Staff include:

1 Accountant	34 Fitter	1 Messenger
1 Paymaster	11 Storekeeper	32 Watchmen
1 Transport Officer	33 Clerk	36 Labourer
32 Operator	70 Craftsmen	17 Security
17 Foremen	61 Driver	16 Chainmen
2 Specialist	3 Tyremen	3 Greaser
8 Surveyor	5 Chargehand	8 Banksmen
5 Costing Clerk	23 Apprentice	51 Communal Labourer
		Foremen
		Support Staff

Source: CARE/Sierra Leone monthly report, May 1979.

- Peace Corps (Assistant Director)
- Ministry of Agriculture (observer)
- Ministry of Social Welfare (observer)
- Ministry of Tourism (observer)

This Feeder Road Project Coordinating Committee meets three times a year to choose road alignments for construction, based on the list submitted by IADP/CARE representatives, and to discuss any other issues related to road selection. Before Phase II construction began, the 400 miles of road planned to be constructed had already been selected, and AID retained the right of prior approval over "substantial deviations or changes to the road selected or to the design. . ."2/

4. Reasons for Shortfalls

It is difficult to measure the success of CARE (as opposed to the success of the Rural Penetration Roads Projects) by comparing actual construction to projected construction because of a number of factors that made project goals unrealistic. The 1977 evaluation of the CARE Feeder Road Project discussed a number of these factors.

First, the AID grant for Phase I was not signed until July, 1975. FY 1976, the expected second year of the project had already begun, and one full construction season had been lost. Yet construction did not begin until November of that year because CARE had to wait for the GOSL's Feeder Road Coordinating Committee to select the roads to be built. Before CARE could begin construction in Phase I, it had lost 16 months (July 1974 - November, 1975).

Second, the technique of using rehabilitated construction equipment to keep construction costs down proved uneconomical because more frequent repair and maintenance was necessary. Spare parts were difficult to obtain and required longer delivery times. These factors contributed to a low average plant availability of 55 percent, as opposed to an assumed minimum availability factor in construction estimates of 70 - 75 percent. With less equipment available at any one time, fewer roads per month could be constructed.

A third factor reducing mileage constructed in Phase I was the use of Peace Corps and British V.S.O. volunteer engineers and technicians.

2/ CARE Rural Penetration Roads II OPG Proposal, p. 14.

Although lower cost than experienced engineers, some of these early volunteers did not have sufficient skills to meet CARE's needs. Volunteer engineers currently being provided by the Peace Corps and V.S.O. have higher skills and function more effectively. Volunteers do often leave after one two-year tour; thus, there is a continual struggle to replace volunteer engineers in critical positions.^{3/} In spite of these difficulties, the use of volunteer engineers has made possible considerable cost savings and has proven to have been a wise choice.

The fourth and most important factor causing lower than expected road construction was the GOSL's insistence that the CARE feeder roads be built to Class IV standards. The design characteristics for Class IV roads in Sierra Leone are the following:^{4/}

Design Standards--Class IV Roads

1. Roads

Average Daily Traffic (ADT) - Less than 151 vehicles/day^{5/}

Surface Type - 6-inch minimum thickness,
compacted laterite

Design Speed - 25 miles per hour

Minimum radius of curvature - 300 feet

Maximum gradient - 10 percent

Formation width (roadbed) - 16 feet

2. Bridges

- British standard, 153 Part 3 A
(equivalent to H-20 loading)
- 12 ft. wide, inside to inside,
curbs, with provision for bridges
to 22 feet in width where warranted
by traffic and area development

3. Drainage Structures

- Corrugated metal pipe culverts or
pre-case reinforced concrete pipe

^{3/} CARE Rural Penetration Roads Operational Program Grant (OPG) proposal, pp. 14-15, 16.

^{4/} Ibid., pp. 16-17.

^{5/} The majority of CARE roads in selected areas had a projected ADT of less than 50 vehicles/day.

According to the 1977 evaluation of the CARE Feeder Road Project, the cost and construction time implications of the GOSL's stipulation of Class IV standards were not known. CARE was basing construction cost and time estimates on its previous construction experience. However, CARE's previous experience was in building rudimentary crop extraction roads with simple earthworks and in using available surfacing materials adjacent to the road. These were the types of roads that the World Bank and the Eastern IADP project management expected and desired to be built. However, the GOSL disagreed then and continues to insist that CARE build roads to its Class IV standards.

Construction of Class IV roads requires much more earth movement for embankments, hauling of select surfacing material for longer distances, surface compaction with equipment, installation of more elaborate structures, and other more complicated and costly procedures. The GOSL's requirement that CARE construct roads of Class IV standards has meant, in combination with the other factors mentioned above, that fewer miles of roads could be constructed with the available funding. The World Bank and the project staff of the two IADP's are dissatisfied that CARE is building significantly fewer miles of feeder roads per year than was anticipated and do not feel that Class IV feeder roads are economically justified for the IADP areas. Although CARE could build more miles of road with lower standards, the need of the IADP's for the roads to be open during the rains argues for the current standards. Staff of both IADP's mentioned their need to use feeder roads during the rainy season so that extension agents can advise farmers and deliver inputs. Many of the roads and tracks that CARE is rehabilitating or upgrading were of lower standards. Their lower standards, in combination with lack of maintenance, explains to a large degree why they are no longer adequate for IADP purposes. Therefore, it seems that the Class IV standards are appropriate, given Sierra Leone's heavy rains.

The construction target of Phase II of the project--400 miles over three years--also proved to be over optimistic. Still, CARE will surpass 60 percent of the target (242 miles vs. the goal of 400 miles) if it is able to meet its FY 80 construction estimate of 102 miles. The main problem in Phase II was an unanticipated six month delay in AID/Washington approval of funding for the project--from August, 1977 to February, 1978. Without AID funding, CARE was unable to order the new equipment and spare parts needed for its construction work. Consequently, it was able to construct only 63.1 miles of the planned 133 miles in the first construction season. However, it is likely that even with all of this equipment and spare parts the annual construction targets for Phase II would have been excessive, since CARE was only able to construct 77.2 miles in FY 79 and estimates it will complete 102 miles in FY 80.

Mainly because of delays in project approval and inaccurate estimation of construction time and cost, the Rural Penetration Roads Project fell far short of its objectives in both Phases I and II. CARE's experimentation with used equipment and volunteer engineers also slowed construction somewhat. Both AID and CARE share responsibility for these shortfalls. At the same time, one must recognize that the construction or rehabilitation of 417 miles of feeder roads over five years in a country whose total feeder road network in 1974 was less than 600 miles (of which 587.3 miles were judged as in bad condition) is a significant accomplishment, if done at a reasonable cost.

5. Costs per Mile

Originally projected costs per mile in Phase I were estimated at \$4,000/mile. Because of the delays in funding, high equipment downtime, poor cost estimation, and other problems discussed above, total mileage constructed or rehabilitated in Phase I was only a fraction of the 900 miles contemplated. Therefore costs per mile were much higher than anticipated - \$15,125 per mile. Table 5 shows more detail on Phase I costs.

Table 5. Cost Per Mile - Phase I

Total Project Cost	\$3,199,256
Less Undepreciated Equipment and Inventory	561,456
Total Net Project Cost	<u>\$2,637,800</u>
÷ 174.4 Miles of Road Constructed*	
Gives a Cost Per Mile of	\$ 15,125

*CARE/Sierra Leone.

Source: 1977 Evaluation, CARE/Sierra Leone Rural Penetration Roads Phase II, p. 29.

Phase II costs per mile were projected to be \$12,000 per mile, the actual cost per mile that the March 1977 evaluation had found as the first Phase of the project was going on. However, the final cost per mile in Phase I was actually \$15,125. As in

Phase I, these Phase II costs assumed a higher level of road construction than will actually occur. If CARE builds or rehabilitates 102 miles of feeder roads in FY 1980 as projected, the cost per mile for Phase II will be \$29,400. Table 6 gives more detail on the derivation of these costs.

Table 6. Projected Cost Per Mile in Phase II

Total Project Cost	\$8,521,100
Less Liquid Assets, Undepreciated Equipment and Inventory	1,394,000
Total Net Project Cost	\$7,127,100
÷ 242.3 Projected Miles of Road Constructed Gives Cost Per Mile of	\$ 29,400

Source: 1979 Evaluation, CARE/Sierra Leone Rural Penetration Roads Phase II, Annex G.

Assuming a total of 416.7 miles of road constructed over both phases of the project, the weighted average of costs per mile over the life of the project is estimated to be \$23,400 (or \$14,500 per kilometer).

Admittedly, estimation of the costs per mile was poor in both Phases of this project. However, cost estimation for road projects in developing countries is not known for its accuracy. The weighted average cost per mile of \$23,400 (\$14,500 per kilometer) for Phases I and II is somewhat overstated because the figure includes costs for maintenance of the roads which CARE performs for two years after construction. On some CARE roads which have served as alternate trunk routes, more extensive maintenance work than anticipated has been necessary. On the other hand, the cost per mile is somewhat understated because no estimate is included of the economic costs of volunteer village labor or local materials provided at no financial cost to CARE. These actual costs per mile are quite reasonable, given the quality of roads constructed.

II. IMPLEMENTATION

The previous discussion of reasons for shortfalls identified a number of problems that made achievement of the original road construction targets impossible:

- Delays in AID funding of Phase I and II of the project combined with delays in GOSL selection of sites meant (1) the complete loss of the first construction season (September 1974 - May 1975) and loss of part of the second (September 1975 - November 1975) in Phase I and (2) the loss of essential equipment and spare parts for the first construction season in Phase II (September 1977 - May 1978).
- Attempting to rehabilitate and keep in operation old construction equipment proved less economical than purchasing new equipment.
- Utilizing less expensive, volunteer engineers and technicians meant initial periods of inefficiency until they gained experience and until volunteer agencies began providing more suitable volunteers.
- Non-recognition that GOSL's insistence on Class IV roads meant higher cost and slower construction made initial construction targets and cost per mile estimates quite inaccurate.

A. Coping with Implementation Problems

In spite of these delays, faulty assumptions, and fuzzy planning, two annual evaluations have concluded that CARE has coped about as well as could be expected in organizing and carrying out the project. The 1977 evaluation of the feeder roads project came to this conclusion:

Based on the evaluation team's on site review, the financial and comparative cost analysis, and the opinions of rural development experts located in the project area, the CARE Rural Penetration Road Project has been successful in constructing feeder roads complementing rural development schemes in the Eastern area of Sierra Leone. The criteria used in making this judgment must necessarily discount the unrealistic targets established by the Grant Agreement in terms of miles of road to be constructed within the three year life of project, and the total budget. (emphasis added)

The original three-year targets of construction of 900 miles of rural penetration roads, 120 bridges, and 7,425 culverts at a total cost of \$4 million (estimated \$4,500 per mile) were unrealistic. In retrospect, responsibility for the planning deficiencies rest with both CARE and AID for (a) lack of on-site engineering expertise to review

the proposal; and (b) lack of appreciation of Class IV road standards as opposed to the crop extraction roads CARE had been constructing in Sierra Leone prior to the AID grant. (emphasis in original) 6/

The 1978 evaluation of the overall project (and the first in Phase II), reported that the six-month delay in AID funding of the second OPG meant that essential equipment and spare parts did not arrive until after the 1977-79 construction season. This delay was quite possibly necessary because among the important questions to be resolved were adequacy of (1) GOSL funding and (2) the maintenance capability of the Sierra Leonean Ministry of Works. On these issues, the 1978 evaluation found that--

CARE's performance has been satisfactory. Despite the handicap of delayed AID authorization and availability of AID funds, CARE has effectively carried out its responsibilities in the areas of administration, staffing, procurement, construction, maintenance, maintenance training and reporting . . .

. . . CARE was prevented from obtaining the critically needed additional equipment and spare parts during any part of the first year's construction period, without which the intended 1st year production targets were never expected to be met; four of the five donors to the project made satisfactory and timely contributions to the project. AID's delayed authorization was the primary cause for production shortfalls

. . . Of the six basic assumptions upon which the project's effectiveness and its authorization were based, three of them have proven to be erroneous, thereby contributing to unexpected reduced production and increased costs. The fundamental assumption that the subject grant would be approved and authorized by August 1977 to permit equipment and spare parts purchase and availability by the December 77 start of the dry construction season, proved to be optimistic by six months. This seriously affected the three other project assumptions of (a) timely availability of all donors' contributions (b) timely delivery of new equipment and (c) timely availability of spare parts for old equipment. The delay resulted from lengthy discussions and resolution of AID/W concerns about justifications of short-spur roads of 3 miles or less and about guarantees by GOSL for their budgetary support and the past and future road maintenance capability of their Ministry of Works (MOW) 7/

6/ 1977 Evaluation, CARE/Sierra Leone Rural Penetration Roads Phase II, p. 2.

7/ 1978 Evaluation, CARE/Sierra Leone Rural Penetration Roads II, pp. 5, 7, 3.

CARE has shown an ability to deal with other implementation problems. Volunteer engineers and technicians sometimes do not finish out their two-year tours, although that is less a problem now than in the past. Other volunteers find the experience rewarding enough to extend their tours or to work directly for CARE after completing their tours. When volunteers who have been managing one of the major equipment workshops or one of the construction teams leave, there are often difficulties in replacing them. Yet in spite of these significant personnel difficulties, road construction has progressed.

Currently, the CARE project coordinator is filling two jobs and may soon have to handle a third function unless replacements are found. Similar difficulties occur continually. Nevertheless, during substantial contact with the project staff it was observed that staff members were conscientious and enthusiastic, willing to work long hours, and quite resilient in handling continual frustrations and problems.

B. Experimentation and Innovation

In addition to its ability to cope with project implementation problems, CARE has undertaken a substantial amount of experimentation and innovation. Important for developmental objectives, this experimentation may have contributed to lower road construction mileage and higher costs. A number of aspects of experimentation are discussed in a lengthy letter from the CARE Project Coordinator to the Chief of the Projects Office of AID's Regional Development Services Office in Abidjan, Ivory Coast (REDSO/WA). ^{8/}

1. Machinery and Structures

Over the last six years, CARE has substantially changed its methods of constructing roads from a more labor-intensive or labor-based approach to a more equipment-based approach.^{9/} A later section will discuss this shift. (Section II.E). As CARE moved to using more road construction equipment, it first acquired second-hand equipment in Sierra Leone and in neighboring Liberia and attempted to rehabilitate the equipment. However, continuing breakdowns of this equipment combined with difficulties in obtaining spare parts led CARE to shift to the purchase and use of new road construction equipment.

^{8/} Letter of May 29, 1979 from Mr. Dennis Brown, CARE Feeder Road Project Coordinator to Mr. James Hradsky, AID/REDSO/WA. Much of the succeeding discussion is taken from that letter.

^{9/} The World Bank, as a result of its substantial research program in the substitution of labor and capital in civil construction, has adopted the terms "labor-based" and "equipment-based" to describe relatively more labor or more equipment-intensive construction methods.

As CARE was shifting to the use of new equipment, it also experimented with various lower-cost possibilities in building bridges and culverts (one of the major expenses in road construction). Early in its construction activities, CARE assumed it would build only culverts of 2 feet in diameter and no bridges or box culverts. This idea had to be scrapped quickly, for some bridges had to be constructed. CARE then asked the GOSL to turn over its railway cars so that CARE could try using the chassis of the cars as the support span for bridges. However, after some trials, CARE discarded the railroad chassis idea because of

- the cost of transporting chassis to the bridge site;
- the cost of inspecting, removing rust, and painting the chassis;
- the difficulty of gathering a large number of laborers at a site for a short time to fit the chassis into place.

The main support span for bridges then became reinforced concrete beams poured into place. CARE also tried out concrete culverts of varying sizes from 2 feet to 6 feet in diameter, 25-foot span bridges, concrete and steel culverts with headwalls, and steel culverts.

CARE has tried a number of combinations of equipment. The CARE Project Coordinator's letter to USAID's REDSO/WA (Abidjan) office gives a concise description:

Having been for the most part a scavenger of equipment, the "standardization" of machinery has only been a very recent concern. The second AID grant and IBRD allocation made the first major allocations for new plant. Unfortunately we are still very reliant on 10 to 15 year old plant in several critical areas--a scraper, dozers and graders.

Starting with Hallam towed graders and scrapers, we went to D4's, tractors and trailers and a grader. Then with rehabilitation and CARE-Liberia we picked up a D7, D6, and graders (12E). With the Crown agents turnover we acquired our first scraper (TS-14) as well as a front-end loader.

With the start of the second AID grant, a decision was made to stop self-propelled scrapers and get dozers to pull scraper bowls. This was not done out of a dissatisfaction with TS-14's but rather the fear that we would not have the dozer capacity to meet our bush clearing requirements. The dozer/scraper bowl will cut production a bit, but will give us more flexibility. This experiment started April 1979.

We still use the two methods of excavation, scrapers, loader/tippers. We are also exploring going back to using tractor and trailers instead of tippers on road maintenance. ^{10/}

2. Involvement of Local Chiefs and Villagers

An important accomplishment by CARE, both developmental and innovative, has been the involvement of local chiefs and villagers in road construction and maintenance. When CARE project staff begin to survey a road, villagers supply at no charge the stakes, sand and stone as well as housing and food for the workers. During clearing of the 50-65 wide feet right-of-way, volunteer workers help set the line for the bulldozers. When structures are built--such as concrete culverts and bridges--volunteer workers are essential. During a major concrete pour for a large culvert, 100 volunteer workers are needed at one time. The paramount and village chiefs have the responsibility of supplying the workers. For earthworks--earth hauling, building embankments, and laying the 6-inch compacted surface--villagers have little role, but they are again needed on the finishing crew to plant grass on the steep sides of embankments to prevent erosion (especially around bridges and culverts). The CARE project coordinator indicated that the supply of village labor is somewhat erratic. However, he said that when CARE project personnel talk to the village and paramount chiefs and emphasize their need of village workers, the supply of voluntary labor again becomes adequate.

In the three different aspects of maintenance, village volunteer workers play an important role in structural and manual maintenance but little or no role in the mechanical tasks. Mechanical maintenance comprises reballasting (substantial reworking of the road surface and subsurface) as well as regrading to remove ruts and restore the correct road surface. In structural maintenance, additional "relief" culverts are added to handle a larger than estimated water flow. Weak spots in side walls, drainage ditches, and around bridges are reinforced with stoned emplaced in cement--a technique called "stone pitching." In both these tasks CARE personnel use voluntary village labor. For manual maintenance--which involves clearing of drainage ditches and some bush clearing--CARE uses 200 voluntary village laborers eight months of the year. These 200 laborers are supervised by 51 communal laborer foremen who are hired on the recommendation of local chiefs and are paid at the minimum wage of 1.65 Le (\$1.59) per day. Each foreman has charge of 3-4 laborers, and this team is responsible for the manual maintenance of 3-4 miles of feeder road.

According to a number of observers, the result of this involvement of local people with the construction and maintenance of the CARE feeder roads has been local identification with the roads. Chiefs

^{10/} Brown letter of May 29, 1979, to Hradsky (REDSO/WA)

and villagers reportedly regard the CARE roads as "their roads." For GOSL constructed roads, the contrary is reportedly true, and many Government-built roads are also in a poor state of repair.

In 1980 CARE is also planning to experiment with a labor-intensive maintenance system under which CARE would contract with paramount chiefs for manual maintenance of all feeder roads within their chiefdoms. Structural and mechanical maintenance would still be done with equipment. The chiefs would receive payment only after inspection of the work, and the payments could be distributed to those working or placed in a local fund for community projects. ^{11/}

C. Resisting Political Pressures

Early in CARE's road construction activity, various government officials attempted to see that large amounts of the road mileage planned would be constructed in their home areas. From one year to the next, lists of roads selected for construction shifted from one area of the country to another according to the rise and fall of political power or change of Ministries. When AID made its first grant for roads to be built in support of the Eastern IADP, the Feeder Roads Coordinating Committee (see Section I.C.3) in the office of the Vice President was formed, including representatives of various ministries and CARE. A subcommittee, with substantial IADP input, submitted a list of 250 miles of proposed roads. The full committee added 50 miles of roads from the earlier "political lists" to which the national Cabinet added another 30 miles of "political" roads. No additional "political" roads have been included on CARE road site selection lists, although IADP officials and CARE staff mentioned continuing pressure from priests and local chiefs for roads to be built in certain areas and for selection of suppliers of certain materials. Consequently, selection of feeder road alignments for construction has shifted from predominantly political criteria to a relatively more objective basis.

D. Lack of Institutionalization of Feeder Road Maintenance within the GOSL

A major failing of the AID/CARE Rural Penetration Roads effort has been the lack of success in developing a competent feeder road maintenance and construction capability within the GOSL. As an outside organization, CARE is building feeder roads in Sierra Leone in a competent manner. However, if CARE's feeder road program were to end suddenly, it is unlikely that the MOW or any other GOSL agency would continue building the feeder roads essential for the Eastern and Northern IADP's or would maintain the feeder roads already built.

Both Phase I and Phase II of the project had as a major objective the establishment within the MOW of the capability to maintain the CARE feeder roads. The key to developing that capability, according

^{11/} 1979 Evaluation, CARE/Sierra Leone Rural Penetration Roads II, p. 23.

to the Phase II project paper, was a planned World Bank highway maintenance project which was scheduled to begin in October, 1978. However, no attention was to be given to CARE feeder road maintenance until Phase II of the IBRD project (two years after commencement). ^{12/} Sierra Leone's foreign exchange difficulties forced it to request assistance from the IMF, but the GOSL and the IMF were unable until recently to agree on shifts in economic policies. The World Bank maintenance project has never begun, (although there are indications that funding may go forward in 1980) and the MOW had done little (until 1979) to prepare to take over maintenance of the CARE roads. Although the principal condition for establishing MOW capability to maintain the CARE feeder roads vanished when IMF-GOSL negotiations delayed the planned IBRD maintenance project, neither AID nor CARE seem to have planned or taken any new action to establish an MOW maintenance capability. As will be discussed in Section III, AID did condition final funding to the project on GOSL action to insure continued maintenance of part of the CARE roads which CARE will now no longer maintain. However, in spite of a modest initial GOSL commitment, this pressure has not been sufficient to establish a long-term capacity within the MOW for maintaining the CARE feeder roads.

A major reason why the GOSL has felt insufficient reason to act to maintain the feeder roads may lie in the substance of the project funding agreement. AID's grant agreement with CARE contained a covenant under which CARE, not the GOSL, agreed to maintain the roads and to train a Sierra Leonean road maintenance unit for the feeder roads until the IBRD maintenance project could take over this responsibility. Therefore, it seems that the GOSL never committed itself in a formal way to maintain the CARE feeder roads. Surely, this lack of formal commitment made it more difficult for the supporters of the program to force the GOSL bureaucracy to allocate funds for maintenance of these roads.

E. Labor-Based Vs. Equipment-Based Construction

A major but little documented change in CARE construction methods was the shift from labor-based to equipment-based construction methods which took place in the early years of AID funding. ^{13/}

The 1978 and 1979 evaluations of the project discussed the shift. The 1978 AID evaluation indicated three reasons why more equipment-intensive construction methods were adopted:

- The supply of unskilled labor is not constant and fluctuates with the agricultural growing season.
- A daily wage which could be competitive with agriculture could not be paid, and, even if it could, would result in a deficit

^{12/} CARE/Sierra Leone Rural Penetration Roads II OPG, pp. 46-47.

^{13/} A brief statement justifying the choice of equipment-based rather than labor-based construction appears in the Phase II Project paper (p. 24) and is repeated in the 1978 evaluation of the project (p. 12).

agricultural labor supply.

- The type of feeder roads to be constructed requires a considerable volume of earthwork, which, if done only manually, would require an estimated 3,600 persons for 32 weeks to complete 150 miles. 14/

The 1979 evaluation added several other problems with labor-intensive construction in Sierra Leone:

- The difficulties of logistics and organization of such a massive effort.
- The fact that the minimum wage of labor has increased by 65 percent over the figure noted in the last evaluation.
- Adequate compaction of fill is not feasible by manual methods. 15/

The 1979 evaluation concluded that under current conditions labor-intensive construction in Sierra Leone is not feasible. It should be noted, however, that a significant amount of volunteer labor is utilized by CARE in certain construction and maintenance tasks (see above, Section II.B.2).

Although it is likely that labor-intensive road construction may not be suitable for Sierra Leone, the reader should be aware of the forthcoming World Bank manual on program planning and work site organization for labor-based road construction. The result of the World Bank's nine-year research program in the substitution of labor and capital in civil construction, this manual will outline the improved labor-based techniques and methods for work site organization developed from World Bank experience in Asia, Africa, and Latin America. These improved construction techniques involve a varying mixture of equipment and labor according to the task to achieve the lowest cost result with high quality of output. In Kenya the World Bank has cooperated with the Government of Kenya, USAID, and other donors in planning and implementing the Kenyan Rural Access Roads Program in which labor-based techniques are being used. 16/

If the techniques for improved labor-based road construction and work gang organization developed by the Bank are appropriate for AID-financed rural road projects, they should be used. The rural

14/ 1978 Evaluation, CARE/Sierra Leone Rural Penetration Roads II, p. 12.

15/ 1979 Evaluation, CARE/Sierra Leone Rural Penetration Roads II, p. 10.

16/ For more discussion of the work in Kenya as well as description of the World Bank's research program, see The Study of Labor and Capital Substitution in Civil Engineering Construction, Report on the Bank-Sponsored Seminars in Washington, Cologne, Copenhagen, London, and Tokyo, World Bank, Transportation Department, Washington, September, 1978. The AID-funded portion of the Kenya project is titled Rural Roads Systems, #615-Q168.

road construction activity in Kenya utilizing labor-based construction techniques and to which AID is contributing over \$20 million would seem to be a good test of both the construction techniques and the possibility of creating the institutional capacity in host governments for such programs. It is hoped that their experience will be studied and lessons drawn for future rural road projects.

III. WILL THE CARE FEEDER ROADS BE MAINTAINED?

Maintenance of roads, especially feeder roads, in developing countries is problematical. A recent evaluation of the AID-financed Disaster Relief-Arusha Region Drought project in Tanzania (#621-0128), which includes 410 miles of rural road construction, indicated that a number of the roads have deteriorated badly in large part because of inadequate maintenance.^{17/} In a discussion paper for the Office of Evaluation, Dr. Judith Tendler presented concisely a number of the dimensions of the rural road maintenance problem in developing countries:

. . .the problem of inadequate maintenance, which has plagued all road programs, both arterial and rural. One of the reasons that (LDC) highway departments are bad at maintenance is that they have better, more interesting things to do--building new roads, that is, rather than maintaining old ones. Most of the road-construction and maintenance projects financed by AID and the IBRD will, on close inspection, reveal equipment or maintenance funds being diverted to construction--loan covenants to the contrary notwithstanding. Or, promised local maintenance funds will not materialize in the budget at all.

Road construction wins out over maintenance for the same reason that arterial roads are more compelling than rural ones. From an engineering point of view, construction is more interesting than maintenance. The capital budgets for construction, moreover, are politically easier to obtain than the operating budgets for maintenance. Construction also has a high political exchange value that maintenance does not: a legislator can trade support of a road-construction project for votes desired for another project. Nobody thinks of porkbarreling, in contrast, with a road-maintenance budget. ^{18/}

^{17/} Special Evaluation, Disaster Relief-Arusha Region Drought, USAID/Tanzania (Project #621-0128), February 8, 1979, pp. 3, 4, 21.

^{18/} Judith Tendler, "New Directions Rural Roads", Agency for International Development, Bureau for Program and Policy Coordination, Office of Evaluation, April, 1979, p. 44-45.

A. Maintenance of The Sierra Leone Road Network

Carrying out road maintenance requires administrative capacity, adequate funding, and career incentives for employees charged with maintenance. None of these conditions seem to exist in Sierra Leone.

Except for a few lengths of recently constructed hard surface highway, primary and secondary roads in Sierra Leone were observed to be in a deplorable state of repair. In the Southern, Northern, and Eastern provinces of Sierra Leone, little clearing of drainage ditches or brush encroaching on roads was observed except on the primary arterial roads between Freetown and the provincial capitals of Makeni, Bo, and Kenema. On the unpaved trunk road between Makeni and Bo, the drainage ditches on many sections of the road had disappeared. During a heavy rain shower, water ran down or across the road, eroding more of the surface. Advanced transverse and longitudinal erosion made speeds of less than 5 mph necessary in many places. Little indication of grading or reballasting of the road surface was evident, and this same condition was observed on other unpaved trunk roads.

The Sierra Leonean budget includes funding for road maintenance under the Ministry of Works (MOW). Over half of the MOW's annual budget goes for salaries of over 8,000 road maintenance laborers, who are paid the national minimum wage of 1.65 Leones/day (about \$1.58) year-round to perform manual maintenance on particular sections of roads.^{19/} The total cost for these laborers is 369,000 Le per month (\$354,800) or 4.4 million Le per year (\$4,231,000). With few exceptions, these laborers were not seen working on the roads. One group of maintenance laborers was encountered near a severely damaged palm log bridge on the main road between Makeni and Bo. The laborers were doing nothing to repair the bridge but were instead building a shelter for themselves. A Ministry of Works official stated that although the workers were not doing their job, he had little authority over them because they were protected by their union.

To answer why the MOW seems to lack the capacity to carry out maintenance on most of Sierra Leone's road network would require substantial research into the development and bureaucratic context of the MOW which was beyond the scope of this study. However, a major factor may be that career incentives downgrade the importance of maintenance work. An official of the Ministry of Development and Economic Planning (MODEP) stated that the person working on construction of roads enjoys more prestige than the person working on road maintenance. This tends to support Tandler's argument that ways must be found to make it clear to engineers and other employees that maintenance is an important activity that will earn them

^{19/} Evaluation, CARE/Sierra Leone Rural Penetration Roads II (Project #636-0111; OPG/AFR-G-1400), REDSO/WA, October 15, 1979, p. 23.

promotions or maintenance will continue to receive little or no attention. ^{20/}

B. AID's Attention to Maintenance of the CARE Feeder Roads

In its project design and in two past evaluations AID has focused on the question of whether the CARE-built roads would be maintained by the Sierra Leonean MOW. Both the 1977 and 1978 evaluations recommended that the next tranche of project funding be made conditional upon government commitments and actions to provide staff and budget support for maintenance of the CARE feeder roads:

1977 Evaluation: Recommendation Section--Maintenance.

An additional grant from USAID should be contingent upon a GOSL commitment to provide adequate staff and budget for road maintenance. The proposed establishment of a Rural Penetration Road Unit within the Ministry of Works responsible both for technical supervision of construction and maintenance is one good option. ^{21/}

1978 Evaluation: The Ministry of Works performance to date has been less than satisfactory.

Of the 7 tasks not yet started, perhaps the most important nonperformance has been the failure to establish the necessary policy of the Feeder Roads Maintenance requirements over the primary and secondary roads' maintenance needs and the requisite advance planning for staff, equipment, scheduling and costs (initial and recurrent) to eventually assume full and effective responsibility for maintenance of all . . . the CARE feeder roads by 1982, or sooner if possible.

Recommendation: The next annual evaluation report should not recommend the 3rd incremental funding of \$1.050 million for FY 80, unless there is clear and convincing documentation of consistent and positive Ministry of Work's performance from October, 1978 through June, 1979. ^{22/}

However, there was little progress in this area until the 1979 evaluation of the project.

^{20/} Tendler, "New Directions Rural Roads," p. 44.

^{21/} 1977 Evaluation, CARE/Sierra Leone Rural Penetration Roads I, p. 4.

^{22/} 1978 Evaluation, CARE/Sierra Leone Rural Penetration Roads II, p. 6-8.

1. Forcing the Issue of Feeder Road Maintenance.

Because the 1978 evaluation had included the recommendation that some solution be found to the maintenance question before final funding was authorized, the REDSO/WA office in Abidjan wrote Mr. J. D. Sandy of the Sierra Leonean Ministry of Works before the 1979 evaluation took place. This letter raised five separate aspects of the maintenance issue that the evaluation team needed to resolve, with the unspoken alternative's being the cut-off of project funding. The five issues were the following:

- the need for the Chief Engineer of the MOW Maintenance Unit to participate in the evaluation;
- the necessity for a chief of maintenance for the CARE feeder roads in the E. IADP area to be assigned to the MOW workshop in Kenema immediately;
- a request for a MOW decision on how personnel and equipment operating costs for maintenance of the CARE feeder roads would be covered, specific information on who the maintenance personnel will be, and when those personnel would be assigned to the field;
- a request that the MOW immediately draw up a list of equipment destined for maintenance of the CARE roads to be purchased by CARE; and
- a list of the miles of CARE feeder roads that the MOW would begin maintaining in July 1979, July 1980, and July 1981. 23/

When the AID evaluation team arrived in Sierra Leone in July, 1979, it verified that the MOW had assigned a chief of maintenance for the CARE roads in E. IADP area, allocated personnel for that work who would be paid by existing funds of the Ministry of Works, and prepared the list of maintenance equipment to be purchased by CARE. The main problem was the lack of funding by the Ministry of Works for equipment operating costs (fuel, spare parts, and materials) to cover maintenance of the first 77 miles of CARE feeder roads that the MOW was to take over. During field visits by the evaluation team, the MOW's chief highway maintenance engineer, who was participating in the evaluation, indicated that the MOW could provide the personnel for maintenance of the CARE roads but not the operating funds. It was an official of the Ministry of Development and Economic Planning who, after learning of this problem, saw that the official government budget included a line item of 100,000 Le (\$96,000) for

23/ Letter of May 7, 1979, from James A. Hradsky, Acting Chief, Projects Office, REDSO/WA, AID to Mr. J. D. Sandy, Permanent Secretary, Ministry of Works, Freetown, Sierra Leone.

maintenance of these CARE feeder roads. Because the GOSL's FY 80 budget was in the process of being finalized, the timing of the evaluation was significant in making possible the allocation of funds.

2. Why the GOSL Allocated Funds

Why, with an enormous budget deficit, pressure on Sierra Leone by the IMF to cut recurrent expenditures, and pressures to fund other programs, was the GOSL willing to allocate scarce funds for the maintenance of the CARE feeder roads? Obtaining this government commitment seems to have been the result of three factors:

- the perception in Sierra Leone of the CARE Rural Penetration Roads Project as a successful program in building high quality feeder roads;
- the personal interest of Sierra Leone's President, the Honorable Siaka Stephens, in seeing the program continue because the feeder roads were necessary for the success of the Eastern and Northern IADP's. Those efforts were basic to long-term improvement in the Sierra Leonean economy; and
- the willingness of officials of the important Ministry of Development and Economic Planning to intervene to insure funding for MOW maintenance of the feeder roads.

Both national political figures as well as local paramount chiefs and villagers regard the CARE Feeder Road Program as a success. Even given delays and over-optimistic projections, CARE has constructed or rehabilitated 315 miles of feeder roads in a country whose total class IV feeder road network in 1974 was 592 miles. ^{24/} Paramount chiefs want more roads in their chiefdoms. Likewise, government ministers (of whom there are reportedly 40) want more roads built in their areas. Although road selection is relatively objective, the longer the program continues, the better chance a politician has of getting roads in his home area (somewhat analogous to federal buildings in US Congressional districts). The personal interest of President Siaka Stephens in the success and continuation of the CARE feeder roads program is widely known. In addition, the Feeder Road Project Coordinating Committee, which is responsible for road selection, has been established within the office of the First Vice-President of Sierra Leone. Because REDSO/WA had made clear its obligation to withhold the final year's funding for the Phase II of the project if the maintenance issue were not settled, government officials were anxious to insure release of the final

^{24/} See Table 3, "Road Inventory in Sierra Leone."

\$1.1 million for FY 80. A confluence of pressures made a number of actors and organizations in various parts of Sierra Leone setting willing to take reasonable steps to provide funds for maintenance of the CARE feeder roads.

C. Remaining Uncertainties on CARE Feeder Road Maintenance

Even though the MOW now has the money to carry out maintenance of the first 77 miles of CARE feeder roads for which it must assume responsibility, many questions remain on whether the MOW will be able to maintain a growing mileage of feeder roads:

First, it will not be certain that the MOW is serious about maintaining the first 77 miles of CARE feeder roads until those roads are examined after the next rainy season. Unless AID proposes a Phase III of the project with the incentive of additional feeder road construction, there may be insufficient incentive for the MOW to maintain the roads and for MODEP and other GOSL officials to make MOW perform.

Second, each year through FY 83 the MOW will be expected to take over maintenance of more and more miles of CARE feeder roads up to 417 miles by July, 1983. Given a stringent budgetary situation (especially after the OAU Conference in 1980) where will the government find the funds to maintain all the CARE roads built through FY 80?

Third, funds for depreciation and replacement of the maintenance equipment are not allocated this year nor seem likely to be allocated in future years. When the equipment purchased by CARE wears out, how will the GOSL purchase new maintenance equipment?

Fourth, even with a budget line item that earmarks 100,000 Le (\$96,000) for maintenance of the CARE feeder roads, there are fears that some of the funding may be diverted to maintenance of primary and secondary roads.

Fifth, no provision has been made for CARE's training the first maintenance crew to be stationed in Kenema (E. IADP area) or succeeding crews in the maintenance methods CARE has perfected. An important aspect of CARE's maintenance procedures is the involvement of local villagers in structural and manual maintenance (bush clearing and clearing of drainage ditches) for which they provide voluntary labor. This involvement is important in local identification with the roads and in encouraging voluntary labor.

Sixth, when AID ends its funding of CARE feeder road construction, will there be sufficient impetus for continued maintenance of the existing feeder roads? Will a program of maintenance and construction of feeder roads be institutionalized and able to obtain sufficient funding for operation and replacement of equipment?

Finally, how can the GOSL and the MOW give the function of maintaining the CARE feeder roads sufficient status to attract competent engineers, foremen, and laborers?

D. Institutionalizing Feeder Road Maintenance and Construction Through Phase III

Most of the above uncertainties regarding maintenance of the CARE feeder roads relate to the need to institutionalize within some part of the GOSL the bureaucratic, political, and technical capacity for feeder road maintenance. As stated earlier (Section II.D.), the project's objective of developing a GOSL feeder road maintenance program has not been reached. A recent Special Evaluation of the Masai (Arusha) Drought Project in Tanzania, which includes construction of 410 miles of access roads, recommends that AID withhold funding for future road construction in the Arusha area until the Tanzanian Government demonstrates the "commitment and capability to maintain the drought roads." Without necessary maintenance, rains can quickly degrade the roads, and they "can disappear after one year."^{25/} According to this evaluation, the key lesson to be learned by AID from the Tanzanian project is

the critical need to leave in place a functional capacity to maintain, fund, operate, and manage the object of the development effort. (emphasis added)

. . . In this case . . . to build Tanzanian institutional capabilities for low cost road construction and maintenance at the Regional level and below.^{26/} (emphasis added)

In "New Directions Rural Roads," Dr. Judith Tendler paints a more general picture of the difficulties in effecting maintenance of rural roads. As a solution, she suggests looking for maintenance approaches that would minimize the diversion of maintenance funds to construction, such as by using labor-based maintenance methods rather than equipment-based methods.^{27/} CARE intends to experiment

^{25/} Special Evaluation, Disaster Relief-Arusha Region Drought, p. 3.

^{26/} Special Evaluation, Arusha Drought Project, p. 21.

^{27/} Judith Tendler, pp. 44 and 49.

in 1980 with giving more responsibility to paramount chiefs for maintenance of the roads in their area by contracting with them for such maintenance. ^{28/}

If AID funds a Phase III of the CARE Feeder Roads Program, it should focus much more on building institutional capability within the GOSL to construct and maintain feeder roads such as CARE has built. The principal objectives of a Phase III of the CARE Feeder Road Program should be

- (1) training by CARE of feeder road construction and maintenance units in each province with particular attention to CARE's methods of involving local chiefs and villagers in various aspects of construction and maintenance (see Section II.B.2.);
- (2) construction by CARE of the total mileage of feeder roads originally planned to be constructed in Phase II (400 miles);
- (3) detailed monitoring--by CARE or AID staff--of MOW maintenance of CARE feeder roads, as the MOW takes over responsibility for maintaining the CARE roads; and
- (4) detailed analysis resulting in plans of action or decisions on:
 - where in the GOSL to place bureaucratic responsibility for feeder roads--in the MOW, Ministry of Agriculture, MODEP, or elsewhere?
 - the feasibility of relatively more labor-based construction and maintenance of feeder roads perhaps using the methods worked out by the World Bank, in view of the apparent failure of the existing labor-intensive maintenance system for roads in Sierra Leone.
 - how to give the functions of feeder road construction and maintenance sufficient prestige to attract capable personnel.

Before funding Phase III of the CARE Feeder Road Program, however, AID should establish that the IBRD Highway Maintenance loan for Sierra Leone has been or will be approved. This IBRD Highway Maintenance loan is a necessary condition to enable the GOSL to allocate funds for feeder road maintenance. Without the World Bank loan, Sierra Leone will not be able to maintain its primary and secondary roads. Unless these major roads are maintained, feeder road maintenance

^{28/} Evaluation, CARE/Sierra Leone Rural Penetration Roads II (Project #636-0111; OPG/AFR-G-1400), RKDSO/WA, October, 1979, p. 23.

cannot enjoy secure funding. Included in Phase III of the AID-funded Feeder Road Program should be funds for developing and carrying out a strategy to obtain adequate GOSL funding of both feeder road construction and maintenance—including funding of recurrent costs and equipment depreciation.

IV. IMPACTS OF THE CARE ROADS

The basic purpose of the CARE Rural Penetration Roads Program (also known as the Feeder Roads Program) has been to support the World Bank-financed Integrated Agricultural Development Projects (IADP's) in Sierra Leone by increasing access of small farmers to IADP extension agents, fertilizer, improved seed, and market outlets for their rice and cash crops (See Section I.C.).

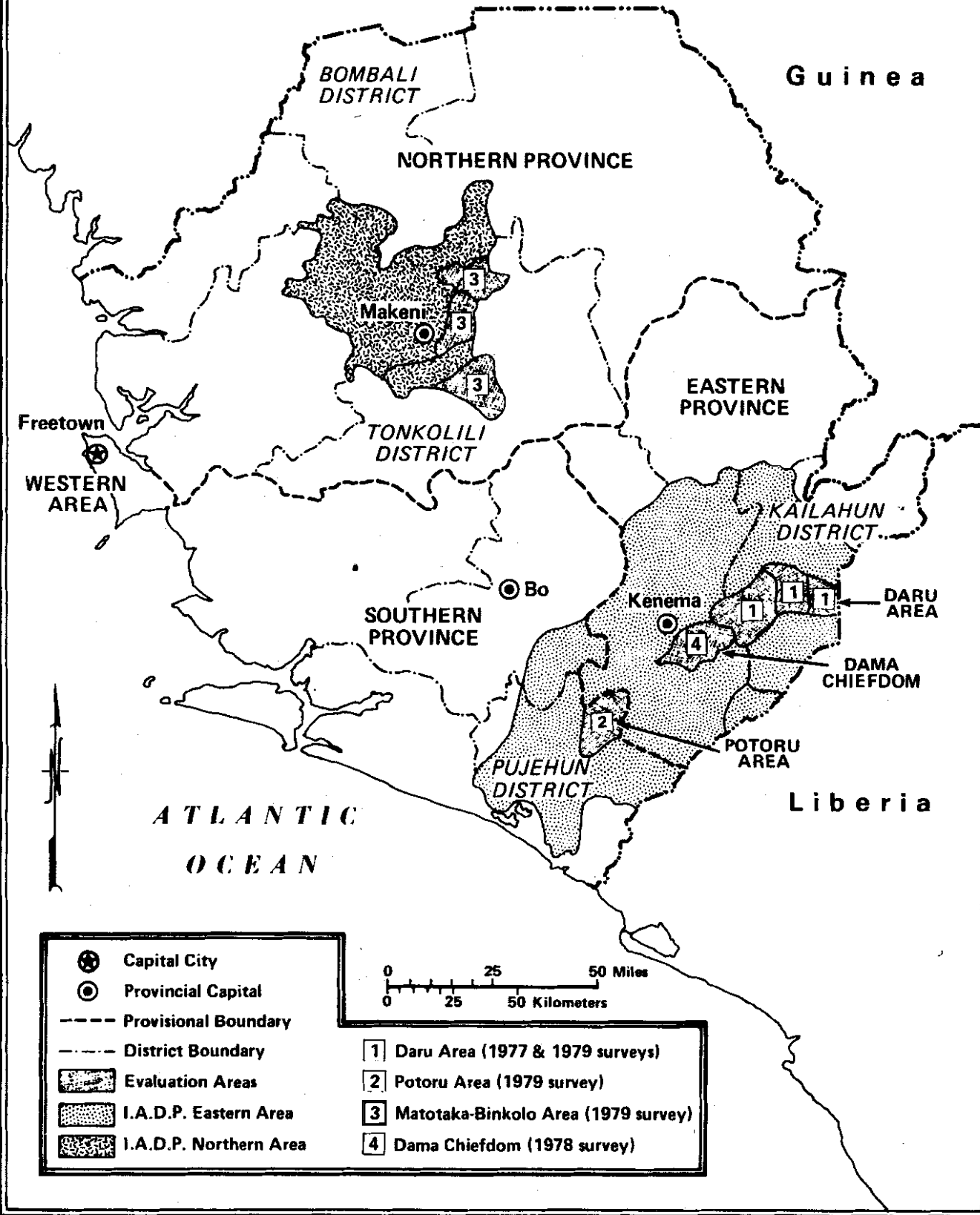
A. Preliminary Considerations

The CARE roads are an integral component of the Eastern and Northern Integrated Agricultural Development Projects (IADP's). Many, if not all, of the impacts of the roads are intertwined with the socio-economic and environmental impacts of the IADP's themselves. This interaction of the CARE roads and the IADP's together with at least two other factors, made determination of the impact of the roads more difficult. First, most communities in Sierra Leone benefiting from CARE road construction had some sort of dry weather road or track before the CARE road. But the heavy rains of Sierra Leone's wet season would usually make such roads impassable for the period June - August. Second, the socio-economic surveys carried out up to now—with one exception—were meant to be baseline surveys more than impact surveys although cross-sectional comparisons were made with communities unaffected by CARE roads to attempt to get early readings on road impact. In spite of these difficulties, more information suggesting the impacts of the CARE roads exists than for most AID-funded rural road projects; therefore it is useful to attempt to draw what conclusions are possible from the existing data.

1. Use of Existing Socio-Economic Surveys

Although field observation and interviewing of key informants contribute to this report, much of the discussion in this section will be based on traffic and socio-economic surveys carried out in 1977, 1978, and 1979 by Mr. Anthony Airey, lecturer in Geography, Lanchester Polytechnic, Coventry, England. These surveys formed part of AID's annual evaluations of the CARE project. Mr. Airey was until 1978 a lecturer at Njala University College in Sierra Leone. When first engaged by AID, he was conducting research on the development impact of rural roads in the South Kailahun district of the Eastern IADP area where CARE was beginning its road construction with AID funding (see Map 6). In 1977, CARE hired Mr. Airey to perform a brief survey of the impact of the first CARE roads to be built. Mr. Airey conducted

Map 6
Sierra Leone: Situation of Evaluation Areas



similar surveys in 1978 and 1979, and, it is hoped, will continue to carry out such surveys in order that the impacts of the CARE feeder roads program can be more fully documented.

For his surveys, Airey has used local university students of the same tribal group as the interviewees, and over the three years more than 400 individuals have been interviewed. In the 1977 survey a pretested questionnaire was administered to 47 village headmen in randomly--selected villages that were both affected and unaffected by CARE road construction. In 1978 and 1979, Airey continued this basic "with-without" research design in choosing villages but shifted to interviewing randomly selected individual households in preselected villages. The 1978 survey included 117 interviews in Doma chiefdom near the provincial capital of Kenema (see maps 6 and 7). In 1979 Airey's interviewers sampled over 275 farmers from 23 villages around the towns of Potoru, Makeni, and Daru (see maps 8-10). The 8 villages in the Daru area were areas that Airey had covered in his first survey in 1977; thus, the survey in the Daru area offered the first look at the impact of the CARE roads over time (1977 to 1979).

Mr. Airey recognizes the problems with the type of limited interviewing he has carried out and in his 1978 and 1979 reports lays out clearly the various types of error likely in the interview data collected. However, he has taken steps to minimize such error by training the interviewers, pre-testing the questionnaire, and incorporating in the questionnaire check questions to test the validity of the answers. 29/

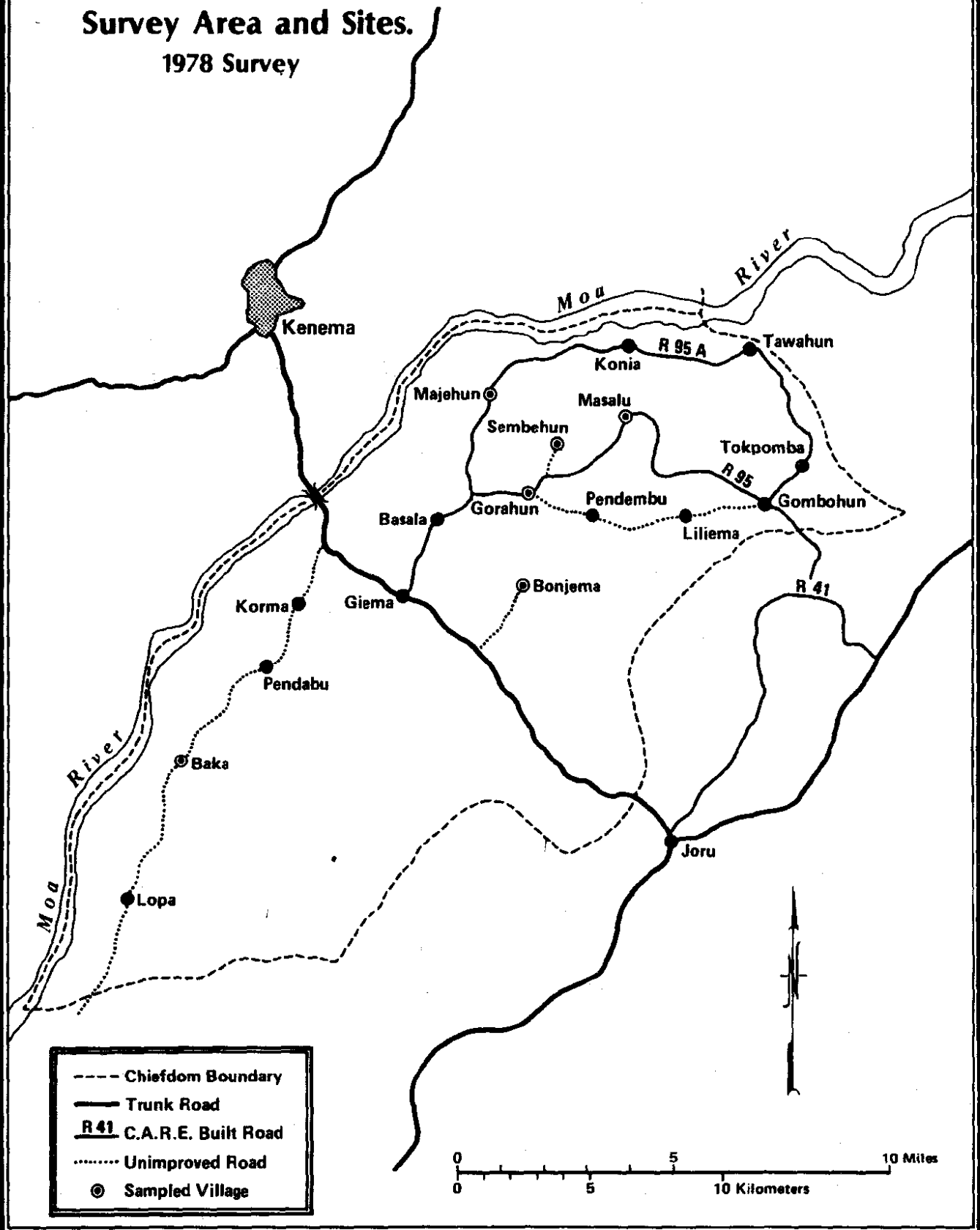
2. The Context of Agricultural Development

The Eastern and Northern Integrated Agricultural Development Projects (IADP's), for the success of which the CARE roads are essential, aim at increasing the cultivation of cash export crops--such as cacao, groundnuts, and oil palms--on land where

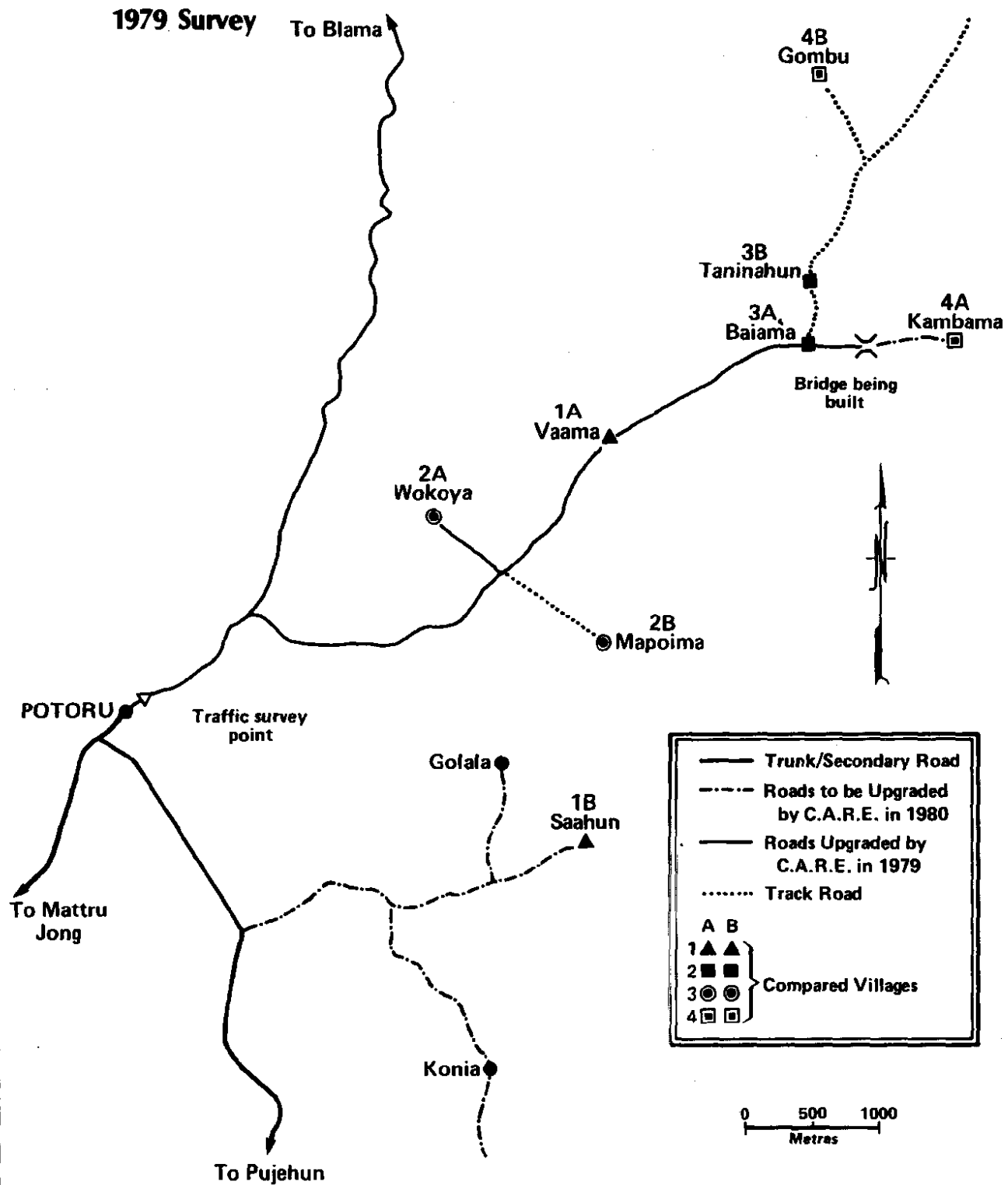
29/ For a description of the survey methodology in each case, see

- (1) A. Airey, "Short Term Socio-Economic Evaluation of CARE Rural Penetration Roads," Attachments C and D to Evaluation of CARE/Sierra Leone Rural Penetration Roads (Grant No. AID/afr-G-1154), USAID/Monrovia, March, 1977, p. 2.
- (2) A. Airey, "Socio-Economic and Traffic Evaluation of CARE Feeder Roads in Sierra Leone," Annex B Evaluation, Sierra Leone/CARE Feeder Roads II (OPG/AFR-R-1400; Project No. 636-0111), USAID/Liberia, October 1978, p. 2, 9.
- (3) A. Airey, "Socio-Economic and Traffic Evaluation of CARE Feeder Roads in Sierra Leone," Annex I to Evaluation, CARE/Sierra Leone Rural Penetration Roads II (Project No. 636-0111; OPG/AFR-G-1400), REDSO/WA, October 15, 1979, pp. 1-2.

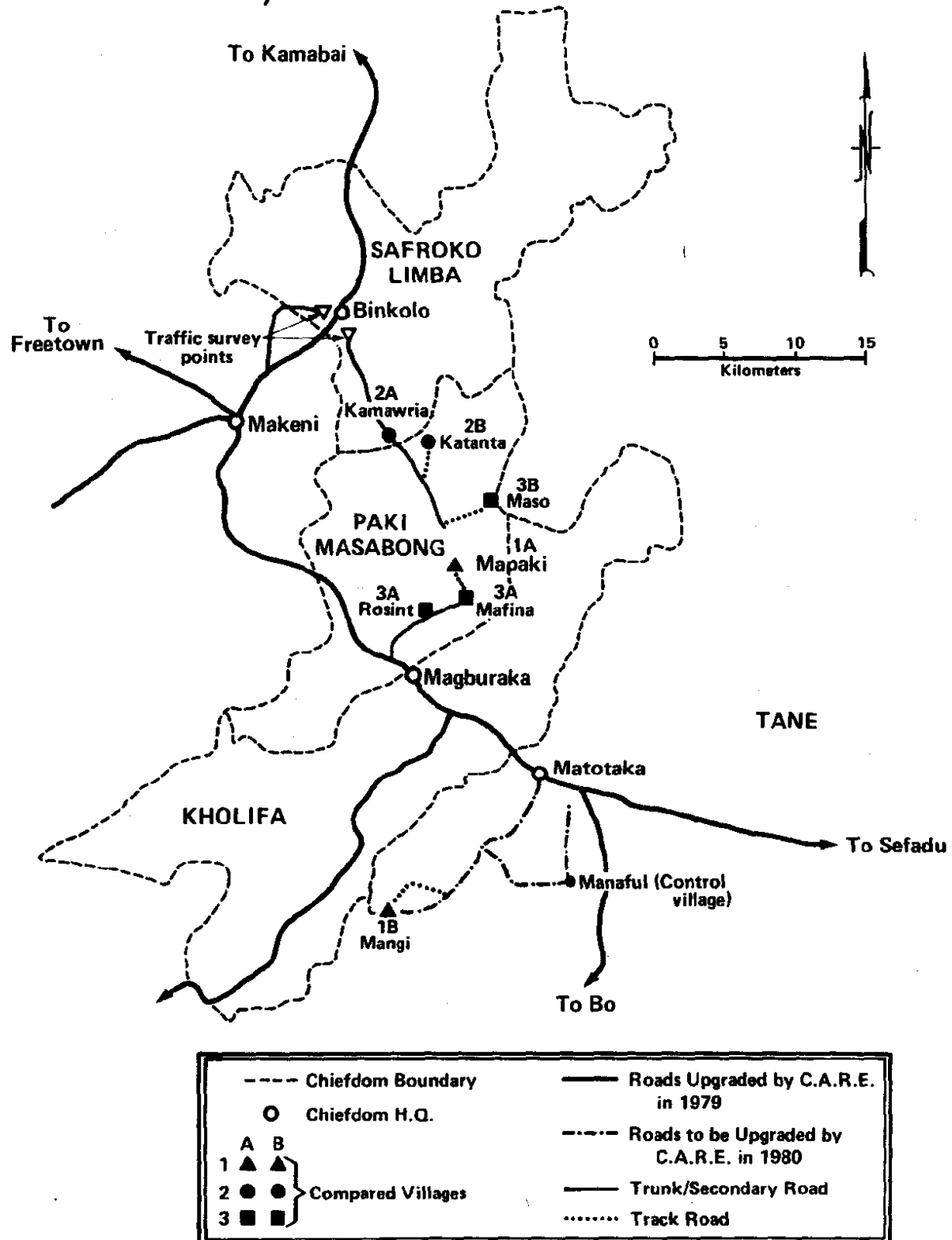
Map 7
Dama Chieftdom: Socio-Economic
Survey Area and Sites.
 1978 Survey



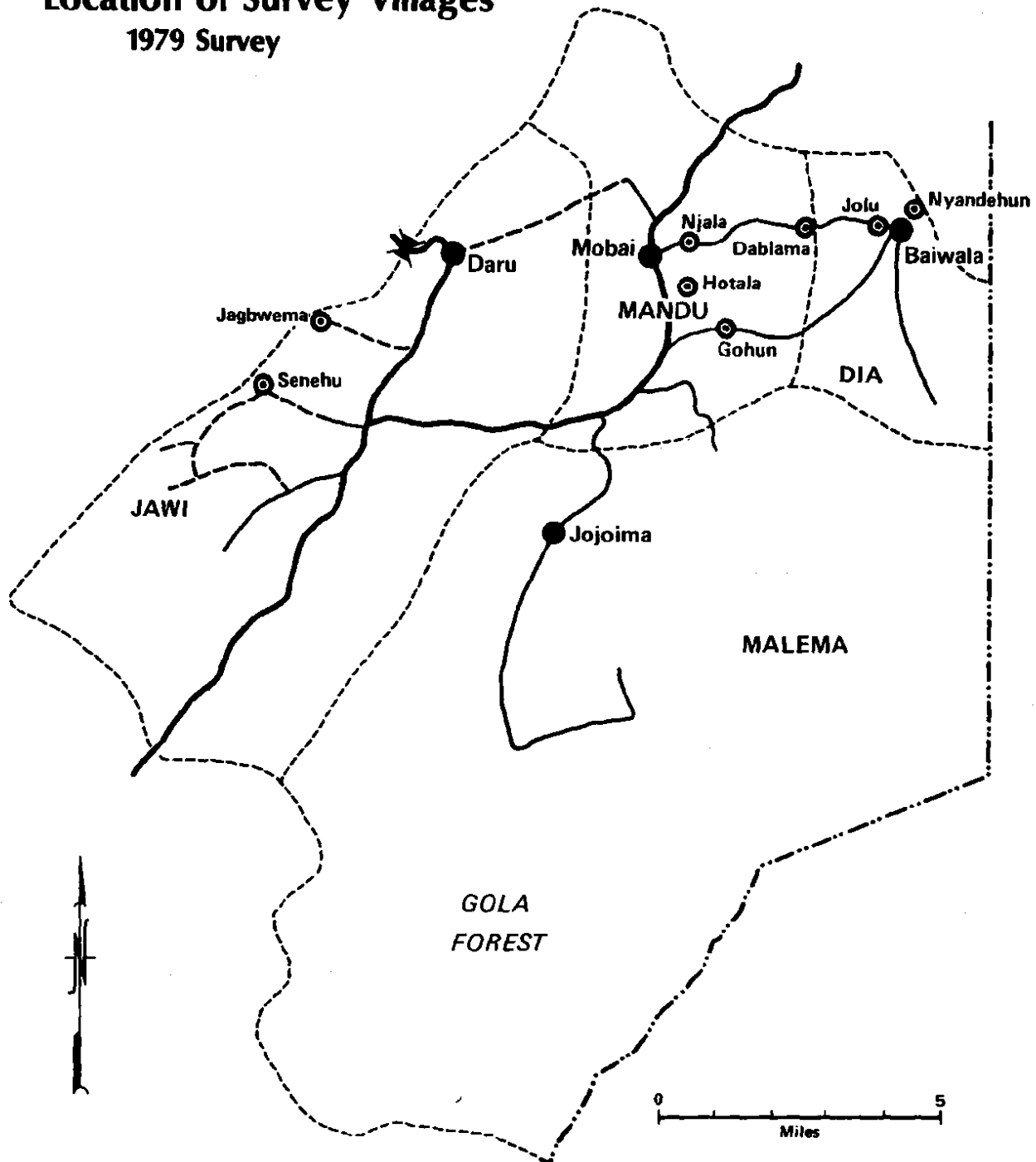
Map 8
Socio Economic Survey in Bari Chieftdom:
Location of Survey Villages



Map 9
Binkola Matotaka Area: Location of Survey Villages
1979 Survey



Map 10
Daru Area: Socio Economic Survey
Location of Survey Villages
1979 Survey



- | | |
|----------------------------|--|
| --- International Boundary | ○ Sampled Village |
| --- Chiefdom Boundary | — Roads Upgraded by C.A.R.E. (since 1976) |
| — Trunk/Secondary Road | --- New Penetration Roads Built by C.A.R.E. (since 1976) |
| ● Chiefdom H.Q. | |

farmers have traditionally grown upland rice. The IADP's are also attempting to introduce improved varieties of upland rice, to increase production within smaller land areas, and to increase swamp rice cultivation.

A brief (and oversimplified) description of the upland rice farmer's practices is necessary. In a given field, the upland rice farmer first clears trees and other vegetation, leaving small stumps up to two feet high. In the first year after this clearing of the field, the farmer broadcasts upland rice seen together with seeds of other crops, such as maize and sorghum. In the second year, cassava, yams, groundnuts, or bananas are grown alone or in a mixed stand on the plot. Cassava and bananas continue well into the third year. The traditional fallow period has been 10-15 years, but land pressure is gradually reducing the fallow periods to as short as 5-7 years.

In trying to introduce an improved variety of upland rice, the IADP's have not had great success because different growing characteristics of improved rice varieties (especially more height of the plant at an earlier time than the traditional variety) can upset the balance of the rather complex intercropping system of the upland rice farmer. IADP progress with regard to other targets such as swamp rice development, cacao cultivation, and oil palm planting has been somewhat behind schedule but, on the whole, satisfactory. Production or marketing targets by the IADP's for swamp rice and cash crops do not seem to exist, however. Therefore, one can only measure progress of the IADP's in terms of area planted. To the extent that the IADP's are succeeding, particularly the Eastern IADP where most of the roads have been built, the CARE roads can be said to be contributing significantly to that success.

B. Impacts on Agricultural Development

1. Extension Agent Visits and Fertilizer Use

A major objective of the CARE feeder roads program was to improve access of farmers to extension advice and agricultural inputs. Officials of both IADP's argued that the CARE roads were essential so that their extension agents could advise participating farmers on new production and input packages, deliver inputs, and expand coverage of the IADP's to more villages and farmers. Extension agent visits and delivery of inputs continue into the rainy season; therefore, feeder roads must be usable during the rains. Because of their adequate drainage, height of embankment and surface compaction, the CARE roads are usable throughout the rainy season.

As of 1979, the Rokel Leaf Tobacco Development Corporation (RLTDC) has begun recruiting tobacco growers in the Northern IADP

area to whom it will provide extension advice. The RLTDG, as well as the Mobole Fruit Company (pineapple and citrus), has reportedly decided to begin activity because of the improved access afforded by the CARE roads. Airey's 1979 survey in the Makeni area found almost three times the proportion of interviewed farmers in communities affected by CARE road construction growing tobacco as in non-CARE affected communities (31 percent vs. 11 percent). ^{30/}

Although Airey's surveys since 1977 are fairly clear on the question of more extension agent visits in CARE-affected communities, they speak less clearly on use of fertilizer.

As Table 7 indicates, communities with CARE roads enjoyed more extension agent visits than communities without CARE roads in three out of four instances. The 1979 Daru survey indicated a substantial drop in CARE-affected villages enjoying regular extension agent visits since 1977 (5 of 7 villages in 1977; 1 of 7 villages in 1979). However, since Airey did not survey non-CARE affected villages, no useful comparison can be made. In two out of four instances (See Table 8), more farmers in CARE-affected communities used fertilizer than did farmers in communities without CARE roads. The 1979 Daru survey indicated a substantial drop in fertilizer use, possibly because of a doubling in the price of fertilizer.

Tables 7 and 8 indicate a decrease in both extension agent visits and fertilizer use in the Daru area in 1979 compared with 1977. These changes may indicate problems with the Eastern IADP extension service rather than providing evidence that improved feeder roads are not necessary for expanded extension services to farmers and increasing use of new inputs, such as fertilizer. Airey's 1978 survey reported that the Eastern IADP extension officers for Cacao and Swamp Rice in Dama Chiefdom traveled much more to visit farmers in villages on CARE roads because it was "easier and quicker to supervise" those farmers. ^{31/}

Given the survey evidence (three indications out of five or more extension agent visits), the statements of the Cacao and Swamp Rice extension officers, and the higher number of RLTDG tobacco farmers in the Northern IADP served by CARE roads, it seems reasonable to conclude that the CARE roads have played a role in increasing IADP and other extension agent visits to farmers in communities served by these roads. The association of the CARE roads with increased fertilizer use is less clear; however, substantially more farmers in communities with CARE roads used fertilizer in two out of three instances where communities with and without roads were compared. In one instance slightly fewer farmers in CARE

^{30/} A. Airey, 1979, p. 20.

^{31/} Airey, 1978, pp. 11 and 13.

Table 7. Farmers Visited by Extension Agents

Survey	Farmers in Communities with CARE Roads	Farmers in Communities without CARE Roads	Control****
1977*	71%	44%	--
1978**	17%	53%	0%
1979 Potoru	33%	17%	18%
1979 Makeni	75%	39%	0%
1979 Daru***	large decrease in visits since 1977	--	--

*The 1977 survey involved interviews of village headmen or elders; therefore the results here refer to whole communities instead of individual farmers.

**Although farmers in the villages without CARE roads indicate more frequent IADP extension agent visits, the results were different when farmers were asked about visits by "agricultural teachers." On that question slightly more interviewees in CARE-affected communities indicated such visits compared to respondents in non-CARE affected communities--31% versus 30%.

***The 1979 survey in the Daru area of CARE affected villages first surveyed in 1977 indicated that only one of seven villages received regular extension agent visits compared to five of seven villages in 1977.

****Control communities in the 1978 and 1979 surveys were more remote or inaccessible communities.

Source: Airey 1977, p. 12.
Airey 1978, p. 10.
Airey 1979, pp. 7, 19.

Table 8. Farmers Using Fertilizer

Survey	Communities with CARE Roads	Communities without CARE Roads	Control Communities**
1978	23%	10%	0%
1979 Potoru	19%	20%	5%
1979 Makeni	65%	39%	0%
1979 Daru*	17%	--	0%

*The 1979 survey in the Daru area was mainly a survey of villages with CARE roads that Airey had surveyed in 1977. During those two years, the proportion of farmers using fertilizer dropped from 33% to 17%. Unfortunately, Airey did not survey villages without CARE roads except for 1 small hamlet of 4 households, which should perhaps not really be considered a control village. Airey suggests that the main reason for the drop in fertilizer use was the doubling of fertilizer prices over the two years.

**Control communities in these surveys are more remote or inaccessible communities.

Sources: Airey 1978, p. 10.

Airey 1979, pp. 7, 19, 33.

Fertilizer use was not surveyed in 1977.

affected communities used fertilizer than farmers in non-CARE affected communities. Moreover, the 1979 Daru survey's indication of a drop in fertilizer use is likely related to price and the large drop in extension agent visits in the same area. If extension services do not function adequately, and if agricultural price policies do not provide incentives to farmers to use fertilizer, roads cannot be expected to bring about agricultural development by themselves.

2. Marketing of Crops

Another major justification for the CARE feeder roads was to enable farmers to market their cash crops more easily. An IADP official argued that farmers in villages on CARE roads can take their crops to market towns more easily and benefit from a better price than if they sell their cash crops to traders who come to their villages. According to this informant, traders who visit villages often pay lower than official prices, have dishonest scales, and grade crops at lower than their actual quality. Supporting this argument, Airey's first survey in the Daru area in 1977 revealed a higher preference of farmers in villages served by CARE roads to travel outside their villages to sell their crops. Two village headmen interviewed in that survey stated that prices were better in larger market towns.^{32/} In 1979 the proportion of farmers in the Daru area who preferred to travel outside the village had increased from 61 percent to 65 percent.^{33/}

Airey's 1978 and 1979 surveys measured the variety and amount of crops marketed by farmers. In two out of three cases (comparing communities with CARE roads and those without), CARE-affected communities marketed a wider variety of crops. Further, in the Daru area, the number of farmers in CARE-affected communities marketing two major cash crops (coffee and cacao) in 1979 had increased substantially over 1977. However, in only one out of three cases did farmers in CARE-affected communities sell greater average quantities of more crops than non-CARE affected communities. In other words, in two out of three instances, farmers in communities without CARE roads sold, on the average, more units of a greater number of crops than farmers in villages served by CARE roads. Airey states, however, that in one area farmers in villages with CARE roads seemed "reluctant to disclose their true level of marketing."^{34/}

^{32/} A. Airey, 1977, p. 11.

^{33/} A. Airey, 1979, p. 36.

^{34/} A. Airey, 1979, p. 10.

To further cloud the issue, the Bonjema village selected as a control community in the 1978 survey marketed on average greater quantities of more crops than either the villagers with or without CARE roads. Second, a higher percentage of Bonjema farmers marketed five of the eight crops surveyed than did the farmers with or without CARE roads. Third, Bonjema farmers marketed on average seven types of crops--as many as farmers in CARE-affected communities and more than farmers without CARE roads. Airey used Bonjema as the control village because it was thought relatively inaccessible. However, during the survey, Airey found that the villagers of Bonjema had constructed their own road to the main Joru-Kenema trunk road. Since Bonjema was less than three miles from this main road, modernizing influences may have been at work in this village for longer and with more intensity than in other villages Airey surveyed, many of which were farther than Bonjema from main roads. ^{35/}

Regarding agricultural income, there seems to be little pattern for communities with or without CARE roads. In three comparisons between villages with and without CARE roads (see Table 9), villages with CARE roads sold a higher value of crops. However, in the 1979 Makeni area survey, the value of crop sales for CARE-affected communities was skewed upward by the much higher average sales of farmers in the main chiefdom town. In the Daru area (surveyed in 1977 and 1979), average real farm income in CARE-affected villages in 1979 had increased by 30 percent over 1977 (415.60 Le to 529.60 Le). Yet the average real farm income of the control village had increased 129 percent (91 Le to 208 Le), although from a smaller base. Villagers in communities newly served by CARE roads also benefit, in the short-run at least, from firewood sales along the roads. Town dwellers in Sierra Leone always need firewood, and the increased traffic on CARE roads brings greater demand for wood. Farmers clearing land of bush near the roads therefore cut and gather wood from the trees they cut down and sell bundles of firewood along the roads.

3. Possible Negative Effects of the IADP's and the CARE Roads

In addition to firewood for sale along the CARE roads, steep, denuded hills were also observed in the Eastern IADP area, suggesting that deforestation and erosion are occurring because of "slash and burn" clearing of steeper slopes for upland rice cultivation. The IADP's are encouraging swamp rice cultivation so that land usually sowed in upland rice is freed for export crop cultivation (cacao, coffee, oil palm). Government price incentives favor export crops

^{35/} A. Airey, 1978, pp. 12-13.

Table 9. Cash Value of Marketed Crops (1978 Prices)

Survey	Communities with CARE Roads	Communities without CARE Roads	Control Community
1978	255.96 Le	415.11 Le	---
1979 Potoru	262 Le	256 Le	---
1979 Makeni*	76 Le	61 Le	---
1979 Daru	increased from 415.60 Le (1977) to 529.60 Le (1979)		increased from 91 Le (1977) to 208 Le (1979)**

*The average income of the chiefdom town of Mapaki had a much higher average income from crop sales (108 Le) compared to other communities with CARE roads (average crop sales of 41 Le); at the same time, this is the area where farmers on CARE roads will benefit more in the future from tobacco sales than farmers off CARE roads.

**The control community was a hamlet of only four households and is probably not representative of communities without CARE roads.

Sources: Airey, 1978, p. 19-20.
Airey, 1979, pp. 11, 24, 36.

in spite of a growing rice shortage, estimated at about 78,000 tons (about 17 percent of estimated total rice production in 1978). Rural people in Sierra Leone prefer the taste and texture of upland rice, although many are growing swamp rice. To continue to grow upland rice and at the same time cultivate more cash crops, farmers can

- plant upland rice in fields they would usually leave fallow for one or more additional years;
- clear steeper hillsides for planting upland rice; or
- increase the distance traveled to an upland rice field—if they can get use of the land.

Eastern IADP project staff estimated that fallow periods in that area have decreased from the traditional 10-15 years to 3-7 years. Airey's surveys in 1978 and 1979 indicate a recognition by farmers in general of diminishing fallow periods. Decreasing fallow periods will diminish soil fertility. In the 1979 survey in the Potoru area, farmers specifically mentioned three cash crops (coffee, cacao, oil palm) as contributing to the decline in the fallow period. ^{36/} In three instances where communities with and without CARE roads were compared, farmers in communities with CARE roads indicated a lower range of fallow periods (see Table 10).

The third phenomenon with possible negative consequences is the shift to swamp rice cultivation. Farmers who recognize the decrease in fallow period are turning to swamp rice cultivation, and the IADP's are encouraging farmers to grow swamp rice. Moreover, more farmers in villages with CARE roads than in non-CARE affected communities are choosing to cultivate swamp rice. Airey's 1979 survey in the Daru area indicated that the proportion of swamp rice farmers in villages with CARE roads had increased from 38 percent in 1977 to 62.5 percent of farmers in 1979. Table 11 indicates that in 2 out of 3 cases, a greater proportion of farmers in communities with CARE roads are swamp rice farmers.

The move to cultivation of swamp rice is encouraged by the IADP's but seems to be occurring independently of IADP extension advice. For example, Airey's 1979 survey in the Daru area (Eastern IADP) revealed that five out of eleven IADP swamp rice farmers had abandoned their swamps because of high repayments and lack of extension visits. At the same time, the proportion of surveyed farmers growing swamp rice in that area had increased from 38 percent in 1977 to 63 percent in 1979. ^{37/}

^{36/} Airey 1979, p. 13.

^{37/} Airey 1979, p. 38.

Table 10. Range of Fallow Period
for Upland Rice Fields

Survey	Communities with CARE Roads	Communities without CARE Roads	Control Communities
1978*	6.6 years	6.9 years	
1979 Makeni	4-6.5 years	6.3 to 8.6 years	9.8 years
1979 Potoru	7.3 to 9.4 years	9.1 to 9.8 years	10.7 to 14.3 years
1979 Daru**	1977--6.5 years 1979--6.7 years		

*Two villages only; 1 with CARE road; 1 without so value is length of fallow period not range.

**Change in fallow period from 1977 to 1979; no measurements for other villages were reported.

Sources: Airey 1978, p. 24.
Airey 1979, pp. 12, 26, 38.

Table 11. Proportion of Farmers Cultivating Swamp Rice

Survey	Communities with CARE Roads	Communities without CARE Roads	Control Community
1978*	64%	22%	---
1979 Makeni	90%	50%	75%
1979 Potoru	60%	70%	27%
1979 Daru	1977--38% 1979--63%		

*Observation in 2 villages only; 1 with a CARE road and one without.

Sources: Airey 1978, p. 24.
Airey 1979, pp. 12, 26, 38.

Cultivation of swamp rice may have negative health, nutritional and social consequences. Farmers may risk higher exposure to water-borne diseases as well as other hazards.^{38/} The diseases to which farmers risk increased exposure are malaria and schistosomiasis, among others. If these risks are real, an important question is whether women are doing a substantial amount of swamp rice cultivation. If they are and if they are weakened by contracting some of these debilitating water-borne diseases, they will be in a more precarious situation during pregnancies. Their weakened conditions could lead to more miscarriages, and shorter spacing between births.

The environmental examination for the Rural Penetration Roads Project discussed the need for the roads to include adequate drainage structures to prevent permanent ponding of water. Standing water would "provide a favorable habitat for insect vectors, particularly mosquito (sic) and tsetse flies (especially near streams in the latter case)." ^{39/} This environmental analysis also stated that low swampy areas, streams, and irrigation canals were habitats for intermediate hosts of the organisms which carry schistosomiasis. Apparently, little or no consideration was given to the role of the CARE roads in supporting efforts of the IADP's to encourage greater swamp rice cultivation. In cultivating swamp rice, farmers dam streams to provide needed water for their rice and work in the ponded water. In so doing, they may increase their exposure to various diseases unless disease control measures have been taken. It should be noted that some observers have found little incidence of such diseases. ^{40/}

Research in neighboring Liberia among the Kpelle people has confirmed farmers' preference for the taste of upland rice and the nutritional benefit to them of the other crops intercropped with upland rice. Moreover, the Kpelle see negative social implications to swamp rice versus upland rice cultivation:

^{38/} Michael Cole et al, The Cultural Context of Learning and Thinking: An Exploration in Experimental Anthropology, p. 41.

^{39/} CARE Rural Penetration Roads Operational Program Grant Proposal, Annex C, "Initial Environmental Examination," p. 18.

^{40/} However, in his study "The Role of Feeder Roads in promoting Rural change in Eastern Sierra Leone," Anthony Airey asked about villagers' medical preferences for treatment of schistosomiasis, among other conditions (p. 37). He reported a large number of responses regarding treatment preference for schistosomiasis; therefore, the disease would seem to be present.

Clearing and burning the bush, planting and tending the rice, and harvesting the crop are all communal events. The Kpelle value the occasion of cutting the forest, with its corporate rhythm of a group of men, spurred on by singers and drummers, laying into a piece of bush. Men show their strength and their zeal as they clear the field.

Harvesting is also a social as well as an agricultural event. There are tests of strength and speed, and the fastest worker receives a special hat for his labors as well as the largest portion of the food, palm wine, and cane juice which are integral parts of the process.

Swamp labor, on the other hand, is thought to be uncoordinated and dirty, not fit occasion for the display of strength in a corporate setting. Swamps, moreover, are thought of as the last resort for women whose husbands are dead or gone to another area. They sow their rice seed late in the season, when there is no hope of an upland farm, and they reap a small and uncertain harvest. By making a farm in a swamp, moreover, a man loses his claim to traditional ancestral farms, a fact that is certain to displease those who had farmed this area in the past and are now dead, but still present to the extended family as ancestral spirits.

Kpelle farmers do not articulate their objections to growing rice in the swamp unless pressured by a persistent (and thereby rude) inquirer, and even then not in abstract, narrative form. Furthermore, if the farmer is questioned by a government official impatient for change, he will almost certainly not quote the reasons mentioned above and will give the casual outside observer the impression of stupid, backward-looking recalcitrance. ^{41/}

Presumably, Sierra Leonean tribal peoples share many of these attitudes. What the overall health, nutritional, and larger social consequences are of an agricultural development strategy that strongly encourage farmers to substitute swamp rice for upland rice cultivation are unclear.

The fourth negative condition that the IADP's and CARE roads may be exacerbating--although there are other causes--is the shortage of rice in Sierra Leone. Communities with CARE roads seem to face more severe shortages than villages without CARE roads. The 1979 Daru area survey found that only 11 percent of interviewed farmers

^{41/} Michael Cole, The Cultural Context of Learning and Thinking, pp. 41-42.

said they grew enough rice for year-round consumption compared to 46 percent of farmers in 1977 who had said they had enough rice. ^{42/} The 1978 survey found that 90 percent of communities with CARE roads felt they had a shortage of rice for year-round needs versus 74 percent of communities without CARE roads. Airey's 1977 survey found the same result—more perceived scarcity of rice in CARE-affected versus non-CARE affected communities. ^{43/}

The causes for the shortage of rice in Sierra Leone are many:

- breakdown of the official rice marketing system;
- smuggling of rice (as well as cash crops) to neighboring Liberia because of higher prices;
- higher prices for cash export crops than for rice leading to decreased rice cultivation in favor of cash crops;
- declining soil fertility because of diminishing fallow periods;
- population growth of more than 2 percent; and
- rural-urban migration combined with the lack of introduction of appropriate labor-saving technologies to break labor bottlenecks at planting and harvest times.

It seems reasonable to argue that the emphasis on export crop cultivation by the GOSL and the IADP's—which may not be offset by IADP efforts to increase swamp rice cultivation and introduce improved upland rice varieties—has at least contributed to a larger increase in land cultivated in cash crops than in rice. In the Daru area, at the same time that the proportion of farmers who said they were growing enough rice declined from 46 percent in 1977 to 11 percent in 1979, 75 percent of the farmers interviewed had increased the size of their coffee and cacao farms from 1974 to 1979. ^{44/}

If the IADP's are contributing to what seems to be a growing rice shortage and other concomitant effects, the CARE roads—since they are an integral component of the IADP projects—are playing a role in a series of negative agricultural impacts that seem to be occurring:

- a growing rice shortage;
- declining fallow periods and soil fertility;
- deforestation and erosion of hillsides;
- increased farmer exposure to water-borne diseases;
- possible social dislocations arising from the decline of upland rice cultivation and the increase of swamp rice cultivation.

^{42/} Airey, 1979, p. 35.

^{43/} Airey, 1978, p. 15; Airey, 1977, p. 9.

^{44/} Airey, 1979, pp. 35 and 38.

Other factors are at work, of course, particularly population growth, government price policies, and the absence of rural energy sources as alternatives to firewood. But the CARE roads are a powerful force supporting the basic trends in agricultural development.

C. Increased Traffic, Transport Services, Commercial Activity

The CARE feeder roads were intended to lead to increased traffic and transport services for rural villages. In addition, it was hoped that the combination of rising agricultural production through the IADP's and increased traffic would lead to expanded commercial activity.

1. Traffic Levels

The first expectation of increased traffic has been fulfilled. Table 12 shows the growth in daytime traffic on selected CARE roads between 1977 and 1979. Further, all of the roads except one, R127/Goma, show a substantial increase in traffic from 1977 to 1979. The Class IV standard to which CARE roads are constructed is deemed by the GOSL as appropriate for less than 151 vehicles/day although the composition of traffic would seem to be equally important. The majority of CARE roads were expected to have an Average Daily Traffic (ADT) of less than 50 vehicles/day. However, all but four of the above set of roads have 12 hours ADT's of over 50 vehicles/day, and two are over the 150 ADT maximum with only a 12 hour traffic count.

As part of his 1978 survey, Mr. Airey randomly chose five roads for twenty-four hour traffic surveys in the rainy season (June-July). Table 13 gives the 24-hour 1978 ADT for these five roads compared to the 1979 24-hour ADT for these roads by CARE in May, 1979. Some of the increased traffic in 1979 compared to 1978 is attributable to less rain. But the difference in dry and rainy season ADT's in 1978 for these same roads was an overall 28 percent, not nearly enough to account for the increased traffic.

In examining CARE's May, 1979, 24-hour traffic counts, one finds seven roads with ADT's over 150 vehicles/day (see table 14).

The three roads with ADT's over 200 vehicles per day (R121, R120, and R70) also are carrying a substantial number of heavy vehicles as are roads R43 and R43A. To a large degree, trucks are using these roads as alternates to the government trunk roads which are in such bad repair. Although the CARE roads are supposedly Class IV roads, the lowest class of road in Sierra Leone, they are in better shape than many of Sierra Leone's trunk roads. Since these CARE roads have only a compacted laterite surface, they cannot withstand such traffic, especially in the rainy season. Significant damage was observed on several stretches. Thus, these roads will likely require complete rehabilitation in a much shorter time than

Table 12. Care Feeder Roads--Traffic Counts 1977 and 1979

Road #/Location	1977 Average Daily Traffic (ADT) 12 hours	1979 Average Daily Traffic (ADT) 12 hours
R43/Benduma	3	98
R122/Baiima	5	33
R90/Najla	5	44
R37/Nyandehun	9	61
R16/Kuiva	11	50
R127/Goma	14	14
R74/Kambama	17	41
R84/Baiwala	44	126
R121/Baiima	69	291
R70/Bombahun	111	180

Sources: CARE/Sierra Leone Evaluation, 1977, Attachment C, Table D.
CARE/Sierra Leone Traffic Survey, May, 1979.

Table 13. Care Feeder Roads--24-hour Traffic Counts 1978 and 1979

Road#/Location	1978 24-hour ADT June and July	1979 24-hour ADT May
R70/Bombahun	90	223
R43/Benduma	76	160
R84/Laoma	79	165
R75/Salina	84	120*
R90/Njala	29	44**

*Count taken at Jojoins, near Salina; 12-hour count only.

**Twelve-hour count only.

Source: Airey, 1978, p. 31; CARE traffic count, May, 1979.

Table 14. Care Roads Carrying Over 150 Vehicles/Day

Road #/Location	24-Hour ADT
R121/Bosma	446
R120/Dambu	306
R70/Bonbohun	223
R43A/Balina	189
R84/Baiwala	169
R43/Benduma	160
R115/Baiwala	152

Source: CARE/Sierra Leone Traffic Count, May, 1979.

intended. Although the high traffic figures on these roads testify to the quality of their construction, their availability as alternate trunk routes removes what pressure might have existed on the Ministry of Works and the GOSL to maintain and repair the actual trunk roads in the area. Foreign aid may have allowed the GOSL to transfer to other uses resources it might have used to repair the trunk roads in this area.

CARE is aware that the placement of its roads should not permit the MOW and the GOSL to avoid maintaining other roads. CARE has therefore modified the road selection criteria so that alignments selected will not link up with other parts of the road network at both ends. Thus, roads recently constructed and future roads will not be substitutes for trunk roads.

2. Traffic Composition

The phenomenon of significant heavy truck traffic on some CARE roads leads to the question of the actual traffic composition on the CARE roads. In his 1978 evaluation and traffic survey, Airey analyzed the (1) composition, and (2) origin and destination of traffic on the five roads in Table 15.

The breakdown of traffic on these roads indicated three types of roads: ^{45/}

- 1) R70 and R43 types. Road with a significant amount of heavy vehicle traffic (7-ton trucks and larger) which signals a trunk road function.
- 2) R75 and R84 type. Roads with the dominant type of traffic being the poda-poda, or light Mazda van, used by villagers for getting to towns and transporting their produce.
- 3) R90 type. Roads whose dominant user is the motorcycle indicating major use by government officials and wealthier individuals. Significant motorcycle traffic in rural areas is more common on CARE roads than on other rural roads, because a relatively smooth road surface is needed.

Airey's analysis of origin and destination of traffic on the above five roads indicated two main classes of traffic:

^{45/} Airey, 1978, pp. 33-34.

Table 15. Breakdown of Traffic Users By
Four Traffic Classes

	R.70 Bombohun	R.43 Benduma	R.75 Salina	R.84* Laoma	R.90* Njala	TOTAL
1. Motor Cycles	101 (16%)	100 (18.9%)	128 (21.8%)	140 (29.5%)	114 (66.7%)	593 (25%)
2. Cars Taxis	170 (27.1%)	191 (36%)	215 (36.6%)	143 (30.1%)	23 (13.5%)	742 (30%)
3. Poda Poda	229 (36.5%)	165 (31.1%)	232 (39.5%)	190 (40%)	31 (18.1%)	847 (33%)
4. Heavy Vehicles	128 (20.4%)	74 (14%)	13 (2.2%)	2 (.4%)	3 (1.8%)	220 (10%)

*6 day traffic count

Source: Airey, 1978, p. 33.

- 1) Traffic whose origin or destination is the local chiefdom towns where people can carry out most of the specialized functions--selling produce, seeking medical attention, buying consumer goods, etc.--that they cannot carry out in their villages. The majority of traffic began or ended in these local chiefdom towns.
- 2) Traffic whose origin or destination is larger towns, such as provincial capitals.

3. Expanded Transportation Services

It is clear that high levels of varied traffic are utilizing most of the CARE roads. Are rural villages on the CARE roads benefitting from expanded transportation services? In what way? From the Airey surveys, 1977-79, it is clear that communities served by CARE roads enjoy more frequent poda-poda (Mazda light van for hauling people and goods) service and at lower cost than communities without CARE roads. Villagers from the latter communities must pay a rainy season surcharge up to four times the regular fare for rides to market towns. In four out of five surveys (1977-79) communities on CARE roads had more visitors than communities without CARE roads. Ownership of motorcycles and bicycles, though rare, was also more common in CARE-affected than non-CARE affected villages (see table 16).

In his survey in the Daru area, Airey found that vehicle ownership in seven communities on CARE roads had increased over 1977 from four bicycles to 5 motorcycles and 2 bicycles, and the distribution of ownership had broadened from less than 5% to 8% of households. ^{46/} No vehicles were owned by persons in the control community.

4. Increased Commercial Activity

According to Northern IADP project staff and others, new businesses have appeared quickly along CARE roads. At least one new weekly rural market was observed to have been established at the intersection of two CARE roads. A MODEP official argued that since farmers can travel to towns and sell their cash crops more easily, they will increase demand by spending their cash on tin roofs, cloth, and other consumer goods rather than burying their cash in tin cans. According to an Eastern IADP official, the CARE roads are enabling bankers from the provincial capital of Kenema to travel as far as twenty miles into the bush to look over the crops of farmers for whom they are considering loans. The CARE roads, argued this official, are making possible the expansion of commercial credit to rural farmers. What was not clear, however, was the income level and

^{46/} Airey, 1979, p. 36.

Table 16. Ownership of Vehicles--Villages
With and Without CARE Roads

Survey	Communities with CARE Roads	Communities without CARE Roads
1977	7 motorcycles	3 motorcycles
1978	1 motorcycle	
	1 bicycle	
1979 (Makeni)*	2 motorcycles	
	1 bicycle	
1979 (Potoru)		1 motorcycle
		4 bicycles
	10 motorcycles	4 motorcycles
	2 bicycles	4 bicycles

*All three vehicles were owned by persons in the largest town.

size of land holdings of the farmers benefitting from this credit. Airey's 1978 survey (see Map 7), discovered the existence of two rice mills and the planned construction of a third. One of the two existing mills was in Majihun, a large town served by a CARE road, and the other was in Baka, a large town without a CARE road. The third mill, however, was to be built in Masalu, a smaller town served by a CARE road but too small to support the mill itself. To survive economically, therefore, it is reasonable to assume that the entrepreneur was counting on additional customers because of the CARE road. Also in Masalu was a cement mason who had come from the larger town of Segbwema to organize the increasing amount of cement construction that was occurring.^{47/}

D. Village Construction and Expanded Community Services

1. Housing and Community Buildings

If the CARE roads were causing or coinciding with increased commercial activity, one would expect to see more houses being constructed in communities with CARE roads than in those without roads as well as more community buildings, such as mosques, meeting halls, and markets. A Northern IADP official stated that he had noticed villagers building new houses as soon as a CARE bulldozer had cleared the first mile of one road. Although Airey's 1978 and 1977 surveys both indicated more housing and community building construction in CARE-affected communities, his surveys of three areas in 1979 showed little or no evidence of increased construction. Two of these 1979 surveys, in the Potoru and Makeni areas, were taken just after completion of the CARE roads; therefore, too little time may have elapsed for a construction effect to have occurred. However, the 1979 survey in the Daru area was taken in areas first surveyed in 1977. Nevertheless, Airey found only a minor increase in number of houses in the eight villages from 185 to 188 houses.

On the other hand, the 1978 and 1977 surveys indicated double and triple the rate of new house construction in villages with CARE roads compared to villages without CARE roads. In addition, CARE-affected communities in the 1977 survey had a wider range of community buildings--such as mosques, meeting halls, stores, and markets. Further, 1978-surveyed villages with CARE roads had more new community buildings (2 more concrete meeting halls) than villages without CARE roads.^{48/}

^{47/} Airey, 1978, p. 22.

^{48/} Airey, 1978, p. 23, 21; Airey, 1977, p. 4-5.

Increased use of cement in construction may be a clearer indication of road impact, since cement is difficult to transport other than by vehicle. Again, Airey's surveys provide indications on either side of the question. The 1979 resurvey of villages in the Daru area showed a 37 percent increase in houses with a cement skin (rather than mud). The control village showed no increased cement usage. Similarly, communities surveyed in 1977 and affected by CARE roads contained slightly more houses using cement than communities without CARE roads. ^{49/} However, a small proportion of houses in CARE-affected communities surveyed in 1978 used cement compared to villages without CARE roads (17 percent to 20 percent). At the same time the 1978 survey revealed that in the small town of Masalu (125 inhabitants) which had recently been connected by CARE road 95a to the Joru-Kenema trunk road, a mosque, a meeting hall, and a large private house had been constructed using cement and concrete blocks. A mason brought from Segbwema to oversee this construction was also making concrete water tubs on order. ^{50/}

Although the indications are not completely clear, it seems that more village construction in general and with cement in particular coincides with CARE road construction.

2. Increased Community Services

Expanded social services, such as health and education, are often associated with better roads. In fact, a newly constructed health clinic was observed at the intersection of two new CARE roads in the Makeni area. Also in the Makeni area, the director of Foster Parents International—a private social service agency—stated that the CARE feeder roads in his area were essential for enabling him to help communities build schools and health centers. He also reported that GOSL leprosy and tuberculosis treatment, onchocerciasis control, and veterinary services were following CARE roads into new areas, as were missionary schools. According to a MODEP official, school teachers are usually unwilling to teach in a school unless they can ride their motorcycles year round to the schools and houses they live in. Motorcycles require decent road surfaces.

Airey's 1979 village survey in this area verified several projects by Foster Parents Plan International to build primary schools and expand a health center in communities with CARE roads. A paramedic with the Leprosy Control Unit in the area indicated that he had been increasing his activities in areas on or near CARE feeder roads. Further, one of the area's village headmen in a community without a CARE feeder road declared that his village had recently lost government health and leprosy control services. In this same

^{49/} Airey, 1979, p. 37; Airey, 1977, p. 4a.

^{50/} Airey, 1978, pp. 21-23.

area, the Northern IADP is beginning well construction which will coincide substantially with CARE feeder roads. Of eleven wells constructed in Tane chiefdom, seven are in villages which will be linked by CARE road N1 to be constructed in FY 80. ^{51/}

Four of Airey's five surveys have indicated increased educational activity in areas with CARE roads. In addition to the activities of Foster Plan International mentioned above, communities in the Makeni area with CARE roads had an average 3.4 children in school versus an average of 2.3 children from households in communities without CARE roads. The 1979 Daru area survey showed a 111 percent increase in the number of children attending primary school in CARE-affected communities.^{52/} The control community exhibited a similar increase. The 1978 survey showed a larger school in Majihun, a CARE-affected community without a CARE road. Finally, the 1977 survey of 47 villages showed that a larger proportion of villages with CARE roads had schools and health centers compared with villages without CARE roads. ^{53/}

To the degree that the positive relationship of CARE roads to expanded community services is based on static "with-without" measurements as opposed to dynamic measures, one could argue that the surveys are simply verifying that CARE roads go to the wealthier or more influential communities. However, the survey indications combined with the statements of the expatriate director of Foster Plan International and the IADP well-digging activity suggest that the improved CARE roads are at least a necessary condition to the spread of health, education, and other services.

E. Other Social Impacts

1. Migration

The question of whether roads cause or discourage rural-urban migration is a difficult question to answer. A recent review of the literature on the impact of low-volume rural roads distinguished such roads' impacts on migration by their relative function:

The spatial impact of low-volume rural roads is complex and area-specific. It is unclear whether roads encourage migration. The evidence suggests that low-volume rural roads strengthen nearby towns as administrative and economic centers, promoting commuting for permanent or short-term work from the surrounding area. In these cases, the direct, initial impact may be to discourage migration.

^{51/} Airey, 1979, pp. 24-25; Airey, 1979, p. 37.

^{52/} Airey, 1979, pp. 24, 37.

^{53/} Airey, 1977, p. 5; Airey, 1978, p. 22.

In contrast, rural arterial roads, in radically reducing the physical and psychological distance between countryside and urban center, may increase migration. Inasmuch as roads facilitate education and the penetration of urban values, they may indirectly stimulate migration over the long term. 54/

A study by James A. S. Blair on the effect of a new hard surface highway in Sierra Leone connecting Tonkolili and Kono districts showed more of a decline in population and particularly in male population, in the road area from 1963-72 (before and after road construction) than in the control area. As part of this study, Blair surveyed the age-sex distribution in selected Tonkolili district villages in 1972. The survey showed a steep drop in population between the second (age 5-15) and third (age 15-25) age cohorts from 2,235 to 946--a drop of 58 percent. Whereas the number of females between the second and third cohorts dropped by 39 percent (986 to 593), the number of males dropped by 72 percent (from 1,249 to 353). These results suggest a substantial rural-urban migration of young males accelerated by the construction of the Tonkolili-Kono highway. 55/

However, the CARE roads, whose impact is the question here, are laterite-surfaced rural roads, not hard-surfaced highways. If the discussion in the literature survey is correct, the effect of CARE roads on population movements would depend on

- the degree to which a particular road functions as an arterial or trunk road (as some CARE roads function) or as a low-volume feeder road; and
- the degree to which the CARE roads permit or coincide with increased formal, urban-oriented education.

In three of Airey's surveys (two in 1979, 1 in 1978), migration from communities with CARE roads was compared to migration from communities without CARE roads. Communities with CARE roads evidenced lower migration than non-CARE affected communities in two instances.

54/ "Socio-Economic and Environmental Impacts of Low-Volume Rural Roads--A Review of the Literature," Devres, Inc., p. 149.

55/ James A. S. Blair, "The Regional Impact of a New Highway in Sierra Leone," African Environment, Vol. III, Number 2; February, 1978, pp. 71-72.

In the two cases when measurements were taken of numbers of children per household in school, the set of communities with higher school attendance per household also showed the higher level of migration. ^{56/} Airey's survey in the Daru area of the same communities he had sampled in 1977 showed an increase in out-migration (from 1.7 persons per household to 2.4 person per household) that coincided with an 111 percent increase in the number of children attending primary school. ^{57/} Thus, by this evidence the CARE roads are associated with less rather than more out-migration, although the case is by no means conclusive. A stronger case is made for the argument that formal education is positively related to migration.

2. Ownership of Consumer Goods

In four surveys of CARE-affected and non-CARE affected communities, Airey took measures of the relative ownership of basic consumer goods between the two groups of villages. The question was whether the CARE roads would create more demand in the communities they served for basic consumer goods. In the 1977 survey he measured only radio ownership rather than ownership of a wider set of commonly owned items: umbrellas, plastic buckets, watches, radios, charcoal irons, and Hondas or bicycles. In two of the three surveys, where ownership of the set of five items was measured, households in communities with CARE roads owned a greater average value of these commodities than households in communities without. ^{58/} In the 1977 survey where Airey measured only ownership of radios, communities with CARE roads also owned a higher average number of radios. ^{59/} Since 1977 the proportion of households in the Daru area owning watches and radios had increased from 27 percent to 28 percent and from 10 percent to 20 percent respectively. The control community had not exhibited the

^{56/} Airey 1979, pp. 8 and 27; Airey 1978, p. 24-25. Recent research on Rural-Urban Migration in Sierra Leone under the African Rural Economy Program of Michigan State University found that investment in education in rural areas and the rate of migration are positively related "largely because formal education qualifies individuals for higher paying jobs in urban areas." See Derek Byerlee, Joseph L. Tommy, and Halib Fatoo, "Rural-Urban Migration: in Sierra Leone: Determinants and Policy Implications," African Rural Economy Paper No. 13, Michigan State University, pp. 106 -107.

^{57/} Airey, 1979, p. 39.

^{58/} Airey, 1977, pp. 11 and 23; Airey, 1978 p. 18.

^{59/} Airey, 1977, p. 14.

same increase.^{60/} An interesting result in the 1978 survey of Dama chiefdom showed CARE-affected communities owning on average more basic consumer goods than non-CARE affected communities but having a substantially lower agricultural income (255.96 Le compared to 415.11 Le). Households in the non-CARE affected communities were sending four times as many children to school, and therefore seemed to be spending a large share of their higher income on education.^{61/} As noted above, increased education would coincide with higher out-migration.

F. Conclusions on Impacts of the CARE Roads

The preceding section has discussed the available evidence on positive and negative impacts of the CARE roads. In each category, relatively clear evidence exists on some points and relatively ambiguous evidence on other issues.

1. Positive Impacts

It is fairly clear that villages served by CARE roads receive more frequent visits by extension agents, both of the IADP's and private companies, such as the Rokel Leaf Tobacco Development Corporation (RLTDC) and the Mobole Fruit Company. Likewise, the CARE roads have led to substantially increased traffic--although some CARE roads are carrying much traffic diverted from dilapidated, unmaintained trunk roads. CARE-affected villages are visited by more poda-podas and other vehicles, and inhabitants of villages served by CARE roads own more motorcycles and bicycles than persons living in communities without CARE roads. Because of the greater ease of transporting heavy items, CARE-affected villages seem to use more cement in housing and building construction. Because of the greater ease of visits to market towns, inhabitants of communities served by CARE roads seem to spend somewhat more of their increased income on basic consumer goods: umbrellas, plastic buckets, watches, radios, charcoal irons, and motorcycles or bicycles. Finally, CARE-affected villages clearly seem to benefit from more government and private health services than non-CARE affected villages.

It is less clear that the CARE roads are associated with other positive impacts. On certain agricultural practices--use of fertilizer and marketing a wider variety and greater quantity of crops--farmers in CARE-affected villages seem to be farther along than those in non-CARE affected villages, but the evidence from Airey's surveys is

^{60/} Airey, 1979, p. 36.

^{61/} Airey, 1978, p. 19-20.

conflicting. In some instances and by some reports, more commercial activity--new rural markets, more commercial bank lending, new rice mills--is occurring along the CARE roads but the indications are not sufficiently widespread or confirmed to support firm conclusions. Similarly, some surveys show CARE-affected villages as having more construction and more schools than non-CARE affected villages, but again the evidence is not clear.

2. Negative Impacts

Although the passage of time may see a number of negative impacts of the CARE roads, at present clear evidence of negative impacts exists in only a few areas. In several additional areas, negative impacts are possible. Farmers in CARE-affected communities have generally reported a shorter range of fallow periods for upland rice fields, more shortage of rice and greater swamp rice cultivation than farmers not served by CARE roads. These phenomena of shorter fallow periods, more serious rice shortage and greater swamp rice cultivation would be consistent with the substitution of export crops (coffee, cacao, and oil palm) for food crops. Under this explanation, farmers planting more land in tree crops would replant upland rice fields after shorter than usual fallow periods or would plant their upland rice in more distant fields--possibly on steeper hillsides. More of such farmers would also shift to swamp rice cultivation, in spite of the preference for upland rice, in an effort to meet their food needs.

What is less clear is whether these shifts are causing more environmental damage--such as loss of soil fertility, increased soil erosion, and worsened deforestation--in areas served by CARE roads versus other areas. Increased firewood sales have been observed along CARE roads. This, combined with the evidence of shorter fallow periods and more scarcity of rice, suggests that the cash crop emphasis of the IADP's supported by the CARE roads may be exacerbating the loss of topsoil, soil fertility, and forest cover. To confirm these suspicions, certain questions need to be answered: (1) are enough farmers shifting to swamp rice cultivation to relieve the downward pressure on upland rice fallow periods; (2) is it true, as argued, that expanded tree crop cultivation will reduce erosion? However, if farmers are shifting sufficiently to swamp rice cultivation to compensate for lower upland rice production, they may be increasing their exposure to malaria, schistosomiasis and other water-borne diseases. Further, the nutritional content of their families' diets may be declining because of the loss of crops traditionally intercropped with upland rice. The shift to swamp rice may also have adverse social impacts because upland rice farming has served a number of social functions. The evidence is not conclusive on these health and social impact questions, but enough indications of a problem exist to warrant serious investigation.

With regard to the CARE roads' effects on migration, the evidence is unclear. Communities with more children in school do seem to experience more migration, but the increases in school attendance do not break down neatly between villages with and without CARE roads. According to Airey's surveys, CARE-affected villages seem to be experiencing less migration than non-CARE affected villages. However, the effect of a CARE road on migration is probably related more to the degree to which the road is serving a trunk or arterial road function—as some CARE roads in the Eastern IADP are doing—versus a feeder road function. The literature indicates that trunk roads are associated with increasing rural-urban migration whereas feeder roads are not. ^{62/}

In summary, the available evidence suggests that the CARE roads have had in the short run more positive than negative impacts. Additional investigation is needed to determine the importance of negative effects of the roads and whether positive impacts will outweigh negative effects.

3. What is Unknown About the Impact of the CARE roads

At this time, a number of basic questions about the impacts of the IADP's and the CARE roads cannot be answered from the available evidence:

- Who is benefiting from the IADP's and the CARE roads--the relatively poor or the relatively well-off?
- Are traders and transporters benefiting more than agricultural producers from decreased transportation costs?
- In order to tell whether the roads are associated with greater production, what are the trends in total and per acre production of rice, coffee, cacao, and oil palm kernels in IADP areas served by CARE roads?
- What are the most fragile aspects of the agronomic system in the IADP areas? How are increased cash crop cultivation and diminishing fallow periods affecting soil fertility, erosion, and deforestation?
- What effects are the IADP activities and the CARE roads having on land values and land tenure?
- How has the role of women been affected by the IADP's and the CARE roads? Has greater ease of transporting produce to market enhanced or diminished marketing roles previously performed? Has increased cash crop cultivation taken more of women's time so that they grow less of vegetables and other crops than they have traditionally added to their family's diet?

^{62/} Devres, "Socio Economic and Environmental Impacts", p. 149.

- Is increased incidence of schistosomiasis, malaria or other water-borne diseases occurring because of increased swamp rice cultivation? What new measures are necessary to control and treat these diseases?
- Are the roads and the IADP's associated with changes in the numbers and size of small rural businesses and industries which "generate both a higher output and a larger amount of employment per unit of the relatively scarce factor, capital"?^{63/} What additional programs--such as basic management training, technical services, new rural credit institutions, or revised economic policies--are necessary to accelerate the rate of formation and growth of such rural businesses and industries?

As the above issues suggest, answering with any confidence the question of what socio-economic and environmental impacts the CARE roads have had requires an understanding of several systems within Sierra Leone: the rural economic system; the various tribal systems and their land tenure practices; the agronomic system; and the trading and transport systems.

The interrelationships within and among these systems will determine what the impacts of the CARE roads and the associated IADP's, have been, will be, who will benefit, and whether negative impacts will outweigh positive effects.

V. RECOMMENDATIONS

From the preceding report can be drawn a number of recommendations regarding the institutionalization in Sierra Leone of rural road maintenance and construction, the need for continuing investigation of the impacts of the CARE roads (in association with the IADP's), the new interventions which future impact studies may suggest, and the further scrutiny required of labor-based construction experience in Africa.

1. Utilize Phase III of the CARE Rural Roads Project to institutionalize feeder road maintenance and construction.

AID should design and fund a Phase III of the CARE Rural Roads Project, provided the GOSL commits itself more concretely to maintenance of feeder roads. To institutionalize feeder road construction and maintenance, the principal objectives of Phase III should be

^{63/} Carl Leidholm and Emyinna Chuta, "The Economics of Rural Urban Small-Scale Industries in Sierra Leone," African Rural Economy Paper No. 14, 1976, p. 123.

- training by CARE of feeder road construction and maintenance units in each province with particular attention to CARE's methods of involving local chiefs and villagers in various aspects of construction and maintenance (see Section III.B.2);
- construction by CARE of the total mileage of feeder roads originally planned to be constructed in Phase II (400 miles); and
- detailed monitoring by CARE or AID staff of MOW maintenance of CARE feeder roads, as the MOW takes over responsibility for maintaining the CARE roads.

Before Phase III begins, careful analysis is necessary to answer the following questions:

- where in the GOSL to place bureaucratic responsibility for feeder roads--in the MOW, Ministry of Agriculture, MODEP, or elsewhere;
- whether relatively more labor-based construction or maintenance of feeder roads (using World Bank expertise) is feasible, in view of the apparent failure of the existing labor-intensive maintenance system for roads in Sierra Leone; and
- how to give the functions of feeder road construction and maintenance sufficient prestige to attract capable personnel.

AID should pay special attention during the 1980 construction season (the last year of Phase II of the project) to CARE's success in its experiment to contract with local paramount chiefs to carry out manual maintenance on feeder roads within their chiefdoms. If successful, this type of maintenance could be built into Phase III of the project.

2. Encourage the World Bank to proceed with the pending IDA loan to Sierra Leone for highway maintenance and assist in implementation if requested.

Unless Sierra Leone is able to maintain its primary and secondary roads, it is probable that feeder road maintenance will receive no budgetary resources. AID should formally urge the World Bank to proceed with its pending International Development Association (IDA) loan for highway maintenance in Sierra Leone. AID should make clear the importance of highway maintenance in its continuing to fund feeder road construction, itself essential to the success of the IDA-funded IADP's. If there are actions AID can take to assist the IBRD in implementing this project, AID should take those actions.

3. Continue utilizing Mr. Anthony Airey for socio-economic surveys of the CARE roads. Mr. Airey has now conducted three surveys of the impact of the CARE roads, each one more detailed and more informative than the last.

Although his methods may require some methodological strengthening, these surveys are a commendable and valuable piece of work. As an existing series of studies examining the impacts over time of AID-financed rural roads, Airey's work seems to be unique in AID. Since further surveys will allow AID to ascertain more clearly changes over time associated with feeder road construction, AID and CARE should engage Mr. Airey for a survey in 1980 similar to those previously done and a more complete study in 1982. The 1982 study should cover roads in several areas to ascertain the impacts over time of the CARE roads constructed in both Phases I and II of the project.

Future survey work by Mr. Airey or investigation by AID into the impacts on the poor of the CARE roads should consider making use of existing data from recent farm management and migration surveys conducted in Sierra Leone by Michigan State University and Njala University College, if such data has not already been used. These surveys interviewed 1300 individuals and households in census enumeration areas chosen from different ecological zones in Sierra Leone. It is possible that this interview data could provide baseline information for areas that now have CARE roads and which Airey has not yet surveyed. Alternatively, some of this data could define baseline conditions for control communities that did not benefit from CARE roads. ^{64/}

4. Improve future surveys of the CARE roads' impact by investigating some of the major unknowns concerning impact of the roads.

Future surveys by Mr. Airey or others should be improved by investigating the following issues:

- whether the predominant beneficiaries of the CARE roads and IADP's are the relatively poor or the relatively well-off;
- whether the IADP's and the CARE roads are exacerbating the problems of declining soil fertility, soil erosion, and deforestation;

^{64/} Inquiries regarding data from these surveys (done with AID support) should be addressed to Carl K. Eicher, Professor of Agricultural Economics, Michigan State University, East Lansing, MI 48824, USA. The migration survey is discussed in Byerlee et al., "Rural-Urban Migration in Sierra Leone," especially page 11-22. For discussion of the results of the farm management survey, see D.S.C. Spencer and D. Byerlee (1976). "Small Farmers in West Africa: Employment Incomes and Productivity in Sierra Leone," African Rural Economy Paper, Dept. of Agricultural Economics, Michigan State University, East Lansing, Michigan.

--whether increased swamp rice cultivation is leading to higher incidence of schistosomiasis, malaria and other water-borne diseases; and

--whether changes in women's status associated with the IADP's and the CARE roads are positive or negative; and

--whether the CARE roads and the IADP's are associated with growth or decline of small scale enterprises. ^{65/}

5. Formulate new or revised interventions in Sierra Leone to accentuate the positive impacts and minimize the negative impacts of the CARE roads and the IADP's.

Given the answers to the questions in Recommendation 4 above, AID and the World Bank should recommend to the GOSL program and policy changes which will maximize positive impacts and minimize negative impacts of the IADP's and the CARE roads. Examples of possible changes could be clearer identification of relatively poorer farmers to aid IADP extension agents in reaching them: new rural energy sources to gradually replace firewood; technical and management training programs to enable small-scale rural businesses and manufacturers to multiply more rapidly and expand off-farm employment; and the creation or expansion of rural credit institutions to mobilize existing savings and capital, support the growth of small-scale entrepreneurship, and assist community self-development efforts.

6. Encourage AID employees in Africa to observe the use of labor-based road construction techniques being used in other rural road projects in Africa, such as that in Kenya. ^{66/}

The larger Kenyan Rural Access Road Program, of which this project is a part, is utilizing many of the improved techniques for labor-based road construction (and for management of such construction) which the World Bank has developed through its research program in the substitution of labor and capital in civil construction. If these techniques

^{65/} See the 1979 AID evaluation of the CARE/Sierra Leone Rural Penetration Roads Project (pp. 35-36) for additional discussion on how future surveys could be improved.

^{66/} The AID-financed Rural Road System project in Kenya (#615-0168), part of a multi-donor effort, is utilizing many of the improved construction and management techniques for labor-based road construction developed by the IBRD. If these techniques are working successfully in Kenya, they may be appropriate to other African countries. Although a long-term study is being undertaken on the impact of the roads, this study reportedly does not include analysis of the experience in developing institutional capability and employee incentives to carry out labor-based construction versus equipment-based construction in the Roads Graveling project (#615-0170).

prove to be successful in Kenya, they may be appropriate for other African countries.

7. Include in evaluations of other AID rural road projects using labor-based rural road construction methods (such as the Kenya project) an analysis of the success or failure in developing institutional capability and employee incentives for such road construction.

Even given appropriate construction and management techniques for rural road construction, development of the institutional capacity and employee incentives to use such techniques is essential.

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